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PLANT LIFE

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1967

EDITED BY

HAMILTON P. TRAUB

HAROLD N. MOLDENKE

THE AMERICAN PLANT LIFE SOCIETY

Box 150, La Jolla, California 92037

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BAU UND FEINBAU DER PFLANENZELLE, by Von Dr. Peter Sitte. Veb Gustav Fischer Verlag, Jena. 1965. pp. 231 28-MDN. Peter Sitte, Professor für Zellenlehre und Biologische Elektronenmikroskopie, Universität Heidelberg, has authored a thorough and detailed study of the gross and fine structure of the plant cell. Thoroughness and mastery of detail is typical of German scholarship in biology. The book under review is an excellent example of this traditional technique.

There are single chapters on Cytological Methods; Molecular Morphology of the Cell; the Nucleus; Cytoplasm and Cell Organelles; Plasma Membranes and Vacuoles; Cell Wall; and a final chapter on the Organization of the Cell. It is a relatively small book, but packed with information served-up in usable form. There are 450 references to original works collected in the rear of the book, along with independent Author and Subject indices. In a separate section there are also from 1 to 8 general references to each sub-chapter topic. This convenient and practical feature will allow investigators to easily increase their information about specific subjects. The illustrations are of high quality except the photographs of mitosis and meiosis. These photomicrographs are either poorly reproduced or the originals were not as sharp as they should have been for good reproduction. An excellent reference book with much original research.—*Thomas W. Whitaker*

A HISTORY OF GENETICS, by A. H. Sturtevant. Harper & Row, New York. 1965. pp. 165. $5.50. Biologists in general and geneticists in particular will welcome this lively history of genetics by one who has lived through and contributed much to the exciting discoveries of this still young disciplne. Professor A. H. Sturtevant tells the story of genetics from pre-Mendelian times to about 1950. The work on the structure and coding of NDA and RNA are purposely omitted as being beyond the scope of the book. Likewise, newer developments in several other important fields such as population genetics, ciliate genetics, etc., are passed over. As Prof. Sturtevant suggests, these subjects have been adequately, and in some cases repeatedly covered by current reviews and special symposia.

Prof. Sturtevant's contribution may not be history as historians understand it, but it is certainly the resource upon which future historians will have to depend for source material. Dr. Sturtevant was either a contributor to, or had first-hand knowledge of, many of the landmarks of classical genetics. As such he writes entertainingly, with authority, and unusual insight.

The book is graced with two exceptional features: Appendix A, Chronology; and Appendix B, Intellectual Pedigrees. The Chronology arranges the great discoveries that are the core of genetics into a time sequence along with the name or names of those responsible for the particular advance. The Intellectual Pedigrees are skillfully done. They demonstrate impressively that a few great teachers along with their students have led the advancing frontiers of genetics for almost half a century.

This delightful book of 165 pages is terminated with an 11 page bibliography and a satisfactory Index.—*Thomas W. Whitaker*

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Botany

AMARYLLIS YEAR BOOK

1967

Amaryllis argilagae

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All editorial correspondence should be addressed to: Hamilton P. Traub, *Editor, The American Plant Life Society,* 5804 Camino de la Costa, La Jolla, Calif.

All persons and organizations interested in amaryllids, and other plants are invited to become members. The annual dues vary from (domestic) $5.00 to $6.00; (foreign, $6.00 to $7.00) depending on the publishing costs. At present they are (domestic) $5.00; (foreign $6.00) in advance which should be sent to:

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PLANT LIFE, VOL. 23, NO. 1, January, 1967

AMARYLLIS
YEAR BOOK
1967

Year Book of
The American Amaryllis Society
34th Issue

GENERAL AMARYLLID EDITION

EDITED BY
HAMILTON P. TRAUB
HAROLD N. MOLDENKE

THE AMERICAN PLANT LIFE SOCIETY
Box 150, La Jolla, California 92037

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[THE AMERICAN AMARYLLIS SOCIETY—continued on page 155.]

PREFACE

The cover design, by Prof. Penrith B. Goff, of the University of Kentucky represents the new *Amaryllis argilagae* as grown by Dr. C. G. Ruppel in Argentina. We are all indebted to Prof. Goff for this beautiful cover.

This thirty-fourth edition of the AMARYLLIS YEAR BOOK is dedicated to Dr. Martin Cardenas, the noted phytologist and plant explorer of Bolivia, who received the 1967 HERBERT MEDAL in recognition of his outstanding contributions toward the advancement of the amaryllids. The Medal is presented to him with the congratulations of all the members. Over a number of years, Dr. Cardenas has discovered various new *Amaryllis* species, and other amaryllids. To the present edition, he contributes an autobiography, a note on the reduction of "Lepidopharynx Rusby" to *Amaryllis* L., and an article on the *Amaryllis* species of Bolivia.

Other articles on *Amaryllis* include breeding reports by V. Roger Fesmire, Joseph Mertzweiller and Clarence J. Crochet; reports on the introduction of new *Amaryllis* species by Claude W. Davis; experiences with the clone 'Senorita', by Keith Brown; accelerating blooming in *Amaryllis* with bottom heat by J. L. Doran; cultural notes by Burr Clouette and Mrs. Fred Tebben; and the annually eagerly awaited report on the *Amaryllis* season of the past year, by Robert D. Goedert.

There are various articles on other amaryllids. These include notes on *Paramongaia* by Dr. Seibert; *Nerine* notes by Emma D. Menninger, and *Nerine* breeding in England, by J. T. Gallagher; and notes on freedom of flowering in *Nerine sarniensis* by Prof. Ken Douglas.

Dr. Vargas contributes notes on *Eustephia* species; Prof. Ravenna reports on the status of *Nothoscordum felipponei* and its chromosomes; Dr. Flory and S. Bose discuss the chromosomes of *Sprekelia;* and Prof. Wilsenach reports on the chromosomes of *Tulbaghia.*

Fred B. Jones contributes an article on *Crinum strictum* in coastal Texas; L. S. Hannibal reports on *Crinum* clone 'June Harris' and the Milk-and-Wine Lily confusion; Mrs. Morris Clint on the culture of *Crinum luteolum* in Texas; and Dr. Zorbach on the culture of Crinums in Maryland.

Quinn Buck contributes a daylily report; L. S. Hannibal reports on *Hannonia hesperidium;* Burr Clouette writes about *Ungernia* culture; Prof. Claude W. Davis reports on *Lycoris* culture in the lower Gulf Coast region; and Dr. E. G. Corbett favors us with an article on the asexaul propagation of *Lycoris.*

A number of new amaryllid species are described,—*Amaryllis argilagae, Eucharis korsakoffii, Hymenocallis azteciana, Allium howardii,* etc.

There are reports on the 1966 Amaryllis shows, In Memoriam notices on Ira S. Nelson, Frank Harrison, Mrs. Emma Louise Davis Hayward; and notes on early daylily hybridizers by Mrs. Nicolet. And there are various other articles and notes as shown by the table of contents.

Contributors to the 1968 issue of the AMARYLLIS YEAR BOOK are requested to send in their articles by August 1, 1967, in order to insure earlier publication of this edition. Unless articles are received on time, publication will again be delayed to June or July or even later as with some issues in the past. Your cooperation toward earlier publication will be greatly appreciated. Those having color slides or transparencies which they wish to use as the basis of illustrations, are requested to have black-and-white prints made, and to submit these with their articles.

December 15, 1966,
5804 Camino de la Costa,
La Jolla, California 92037

Hamilton P. Traub
Harold N. Moldenke

PLANT LIFE LIBRARY—continued from page vi.

WEDDING FLOWERS, DECORATIONS AND ETIQUETTE, by Virginia Clark, 2nd ed. Hearthside Press, 381 Park Av. S., New York, N. Y. 10016. 1966. Pp. 160. Illus. $6.95. This is a complete book on the planning and carrying through the wedding. The members of the Society will be particularly interested in the advice on flowers, foliage, designs, church and home decorations, and the making of corsages, boutonnieres and bouquets. Highly recommended.

THE PICTURE BOOK OF ANNUALS, by Arno and Irene Nehrling. Hearthside Press, 381 Park Av. S., New York, N. Y. 10016. Pp. 288. Illus. $6.95. This attractive new book on annuals by outstanding authorities on the subject will be welcomed by all gardeners. In part I, the annuals, arranged alphabetically (A-Z), are described in popular language, and are profusely illustrated. This part alone is worth the price of the book. In part II, the growing of annuals from seeds is detailed; and in part III, the use of annuals is considered. Highly recommended to all gardeners.

HOME AND GARDEN CALENDAR, 1967,. Hearthside Press, 381 Park Av. S., New York, N. Y. 10016. Paper with plastic ring binding. Desk ed. $1.50; purse ed. $1.00. Illus. The Federated Garden Clubs of New York sponsor an annual flower arrangements calendar contest. In this little book, some of the outstanding photographs of flower arrangements with text accepted are reproduced in calendar form for 1967. Recommended to all interested in flower arranging.

1967 ROSE CALENDAR. Hearthside Press, 381 Park Av. S., New York, N. Y. 10016. Paper with plastic ring binding. Illus. $1.50. In this little book, rose arrangements, and other rose subjects, with text, are arranged in calendar form. Recommended to all interested in roses, and flower arrangements in general.

THE FLOWER ARRANGEMENT CALENDAR, 1967, by Helen Van Pelt Wilson, 21st ed. Wm. Morrow & Co., 425 Park Av. New York, 16, N. Y. Paper with plastic ring binding. The publishers sponsor an annual flower arrangement calendar contest. In this little book, the 21st edition, some of the outstanding photographs of floral arrangements accepted by the publisher are reproduced, with text, in calendar form for 1967. This edition includes among others, four color plates. Recommended to all interested in flower arrangements.

THE GARDENER'S BOOK OF VERSE, edited by Helen Van Pelt Wilson. Wm. Morrow & Co., 425 Park Av. S., New York 16, N. Y. 1966. Pp. 128. Illus. $4.50. This is volume one, and contains poems for five seasons—winter, spring, summer, autumn, and Christmas. The poems are selected from the literature of the world—Coleridge, Cowper, Whittier, Frost, Hardy, Wordsworth, Songs of Solomon, Shakespeare, and many more. Recommended to all gardeners.

PLANT LIFE LIBRARY—continued on page 32.

Dedicated to
Martin Cardenas Hermosa

HERBERT MEDALIST—MARTIN CARDENAS HERMOSA

MARTIN CARDENAS HERMOSA

An Autobiography

I was born in the City of Cochabamba, Bolivia, on November 12, 1899. At the age of seven, I started attending the primary school in Cochabamba. In my twelfth year I entered the high school, SUCRE, also in the same City. In December 1917, I received the "Bachiller en Ciencias y Letras" degree, and in the following, I enrolled at the UNIVERSIDAD DE SAN ANDRES in La Paz for the 4-year course at the INSTITUTO NORMAL SUPERIOR in the SECTION OF BIOLOGICAL SCIENCES.

In 1921, just four months before graduation date, I joined the Mulford Biological Exploration Expedition of the Amazon Basin under the direction of the late Doctor of Medicine and plant scientist, Dr. Henry Hurd Rusby, as the Bolivian Government associate. After nearly one year of plant science exploration in the Amazon Valley with Dr. Rusby and the plant scientist of that Expedition, Dr. Orland E. White, I returned to La Paz, and was awarded the Professor of Biological Sciences degree.

From 1922 to 1930, I was lecturer in Biological Sciences at the INSTITUTO NORMAL SUPERIOR at La Paz, where I taught my students with particular reference to the flora of Bolivia. During 1931 I visited Chile and attended the various sections of the MUSEO DE HISTORIA. From 1932 to 1933 I was Director of a High School in the famous City of Potosi and there had the opportunity of collecting plants in the high Andes.

From 1934 to 1935, I joined our armed forces then engaged in the Chaco War; serving as a member of the Sanitary Corps.

In 1935, I was sent by the Bolivian Government to the U. S. Department of Agriculture, Washington, D. C. in order to study the possibilities of optimum culture of *Cinchona* species in Bolivia. I was already familiar with the subject on the basis of my plant explorations of the *Cinchona* forests in the Department of La Paz. These explorations were undertaken at the request of the Bolivian Government at the time of the Chaco War with the objective of establishing a quinine factory at La Paz.

In 1937, I was elected Rector of the UNIVERSIDAD DE SAN SIMON in Cochabamba, and was awarded the Doctor in Sciences "Honoris Causa" degree. Since 1937, I have been lecturing at the UNIVERSIDAD DE SAN SIMON on plant science, genetics, plant pathology and economic plant science.

In the years 1938, 1948 and 1958, I represented Bolivia at the three South American Plant Science Congresses. I resigned the University Rectorship in 1946, but have continued lecturing. In 1948, I attended the AMAZON HYLAEAN CONFERENCE as President of the Bolivian Delegation. During the same year, I was also Bolivian Delegate to the NATURAL RESOURCES CONFERENCE which convened at Denver, Colorado. In 1944, I was invited by the British Council to spend one year at the

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University of Cambridge in connection with potato research work at the School of Agriculture. From September to December 1945, I was the guest of the U. S. Department of State, and had the opportunity of visiting several American universities and agricultural experiment stations. I have attended the Latin American Conferences of Phytotechnicians held at Bogota in 1955, at Santiago in 1958, and at Lima in 1964. In 1960, I traveled in various countries of Europe, visiting museums and making lineagic revisions at some of the herbaria, particularly at those of Kew and Paris. In 1963, I again visited Europe during the summer and attended the IOS Congress at Vienna as President.

During my vacations, I have traveled through almost all of the South American countries, interested always in plant science exploration. When opportunity offered, during 35 years, I have traveled in the interior of Bolivia; collecting plants and taking photographs of plants and of objects of ethnological importance. I have collected nearly 6,500 numbers of Bolivian plants, including several duplicates which have been sent to various foreign herbaria.

Since 1930, I have been engaged in plant taxonomy; becoming a specialist in the grouping of the Bolivian Cactaceae, *Solanum* (Tuberarium), *Amaryllis* and economic plants. I have proposed four new genera, and 120 new species of Bolivian Cactaceae, seven new species of *Amaryllis*, and 20 new species of wild potatoes.

My vocation of plant science began when I was a high school student under the direction of a teacher who asked us to make herbarium specimens although he was not able to identify them. After my graduation from the University, my tour with the Mulford Expedition as Dr. Rusby's assistant, completed my field training, and my capability of identifying the families of plants. My main specialty has been the Bolivian flora. My diagnoses of new taxa have appeared in various specialized periodicals in Europe and the United States. Some of my cactus diagnoses have also been published in our REVISTA DE AGRICULTURA. I plan to write a monograph on the Bolivian species of *Amaryllis*, and also monographs on Cactaceae, wild potatoes, and various economic plants.

I have been awarded several high distinctions, including the Universidad de San Simon Meritus Medal, the Mary Soper Pope Medal, and the First Interamerican Agricultural Medal. I have been honored with election as corresponding member of the American Botanical Society, Life member of the Potato Association of America, and Foreign Member of the Linnaen Society of London. And now I am honored by the receipt of the William Herbert Medal of the American Plant Life Society.

At present I am Director of the Department of Applied Botany and Lecturer in general genetics at the Universidad de San Simon in Cochabamba.

June 28, 1966,
Universidad de San Simon,
Cochabamba, Bolivia.

COLLECTING AMARYLLIS IN BOLIVIA: REMINISCENCES OF MY ASSOCIATION WITH PROF. IRA S. NELSON

MARTIN CARDENAS, *Bolivia*

My particular interest in collecting and studying *Amaryllis* species began in 1954, when Prof. Ira S. Nelson, of the University of Southwestern Louisiana, visited me at the Department of Plant Science at the Universidad de San Simon, in Cochabamba, and requested information about the herbarium material and living *Amaryllis* plants at our institution. Then I realized that I had collected several *Amaryllis* species in connection with plant science exploration since 1921, when I was a member of the Mulford Expedition into the Amazon Basin.

Prof. Nelson received from me several bulbs of unidentified amaryllids, which were later described as *Chlidanthus boliviensis* Traub & Nelson, *Amaryllis mollevillquensis* Cardenas, and some forms of *Amaryllis belladonna* L. Encouraged by the work of Prof. Nelson, my interest in this group of plants increased very much, and since that date I have brought into cultivation quite a number of amaryllid species, and also interspecific hybrids made by myself. In 1958, Prof. Nelson made a second trip to Bolivia, and I became associated with him.

In October 1958, we made a very interesting trip to San Ignacio de Velasco where we saw many clonal forms of *Amaryllis divigranciscii* Cardenas, and also two different forms of *Amaryllis belladonna* L. We spent nearly two weeks as guests of the Franciscan Mission of San Ignacio, and we were assisted particularly by Padres Lorenzo Hammerschmidt and Carlos Probst. Padre Lorenzo accompanied us in all our journeys in the vicinity of the Mission. On November of the same year, I planned for Prof. Nelson a long trip to the Yungas of La Paz, where I expected interesting findings. This journey through La Paz, El Chaco, Chulumani, Rio Solacama, Irupana, Miguilla, and Espia required five days. At El Chaco, we collected what appears to be *Amaryllis forgetii* (Worsley) Traub & Uphof. At Rio Solacama, we discovered the new species now known as *Amaryllis yungacensis* Cardenas & Nelson. When we arrived at the extremely broad bed of the La Paz River, I pointed out to Prof. Nelson the place named Espia across the River. At the time of the Mulford Expedition we had camped there. This spot is actually covered by inaccessible bushes, and is the type (nomenifer) locality of the so-called ''Lepidopharynx deflexa Rusby''. We discussed the possibility of crossing the three fords of the River between us and Espia in order to obtain bulbs of the amaryllid already mentioned. The River was in a frightening state of flood. It was now a question of going back to Irupana where we had to spend the night, or attempt to cross the river fords in order to reach Espia, where 37 years in the past ''Lepidopharynx'' was collected by Rusby, but apparently no one had collected there since that time. After considering the matter carefully, Prof. Nelson decided that we make the crossing to the place which was 300 yards across the raging River. When we were crossing the second ford in the river, I was frightened when the water reached the height of the engine of our jeep, but fortunately the engine did not stop, and we reached our objective which was several bulbs of "Lepidopharynx deflexa" at its very type (nomenifer) locality.

When we came back to La Paz, Prof. Nelson would have liked to go on to Apolo in search of the green-flowered *Amaryllis viridiflora* (Rusby) Traub & Uphof. Unfortunately, it was the beginning of December and the rainy season was coming up.

By the middle of 1959, I was notified by the Interamerican Institute of Agriculture at Turrialba, Costa Rica, that I was awarded the first Interamerican Agricultural Medal and was to receive it in April 1960. When I informed Prof. Nelson of this matter, he asked me in the name of the Louisiana Society for Horticultural Research, to go on from Costa Rica to Lafayette and address the members of the Society at the Annual Meeting in March of 1960. I brought along several herbarium specimens for Prof. Nelson; among them one unique labeled by me *Amaryllis crociflora* (Rusby) Traub & Uphof.

The subject of my address at the LSHR Annual Meeting was on Bolivian *Amaryllis* which was illustrated with several Kodachrome slides. I spent a week as the guest of Prof. and Mrs. Nelson, who graciously offered me their hospitality and the shelter of their home during my stay at Lafayette.

In 1963, I received a letter from him reporting that the bulbs collected at Espia had flowered, and that it was in fact a form of *Amaryllis cybister* (Herb.) Traub & Uphof. I was astounded by this news, and thought at first that it might be due to an intermixture of labels. However, after looking at the original published illustration made from a drawing based on an ink sketch, I also came to the conclusion that it was in fact a form of *Amaryllis cybister.* I wrote to Dr. Steere, a friend of mine, and director of the New York Botanical Garden, asking for a photograph of the type (nomenifer) specimen of *Lepidopharynx deflexa* Rusby. This arrived in July 1965, when I was invited to attend in Mexico the 49th Annual Meeting of the American Potato Association and to address the members on "The Potential Germplasm of Native Potatoes in the Andes." After this meeting I decided to go on to the United States to visit some plant science colleagues, and then to go eastward to New York City where I would enjoy the World's Fair.

By the beginning of September 1965, I had made two visits to the New York Botanical Garden, and I saw the type (nomenifer) specimen of *Lepidopharynx deflexa* Rusby, which as anticipated was a true form of *Amaryllis cybister* (Herb.) Traub & Uphof. I left a label on the specimen giving the true name.

After stopping off in Brasil, I searched in the Organ Mountains at Teresopolis, near Rio de Janeiro, for *Amaryllis caylptrata* Ker-Gawl. I found it on a tree with a ripe seed-pod.

I returned home to Cochabamba by the beginning of October, and was anxious to write to Prof. Nelson about the interesting findings with regard to *Lepidopharynx*, when I received a cable from the Dean of the Horticultural Department of the University of Southwestern Louisiana reporting the tragic death of Prof. Nelson in an automobile accident on the way between New Orleans and Lafayette. The news distressed me very deeply. The thought flashed into my mind that we were exchanging plans on the preparation of the handbook for Amaryllis Breeders which was intrusted to him by the University. I also realized then that in the United States there were only two plant scientists extensively acquainted with the amaryllids—Dr. Traub and Prof. Nelson; and that there remained unexplored spots in the Peruvian and Bolivian Andes where there still remained undiscovered *Amaryllis* species.

Prof. Ira S. Nelson and myself were very cordial friends and we had in common the background of exploration for new *Amaryllis* species. I had always admired his accuracy in the valuation of the lineagic differences in these very beautiful flowering plants growing unfortunately sometimes in inaccessible places.

June 20, 1966
Universidad de San Simon,
Cochabamba, Bolivia

IN MEMORIAM—IRA SCHREIBER NELSON, 1911-1965

Ira Schreiber Nelson, who received the WILLIAM HERBERT MEDAL AWARD for 1960 (see Autobiography, PLANT LIFE 16: 6—9. 1960), died on November 14, 1965, as a result of injuries sustained in an automobile accident.

Ike, as he was known to all, was born in 1911 in St. Joseph, Mo. He received his B.S. and M.S. degrees in Horticulture from Iowa State University, and undertook additional graduate studies at the University of Missouri and Cornell University. Professor Nelson joined the University of Southwestern Louisana faculty in 1941.

He immediately became actively engaged in all phases of ornamental horticulture, spreading his contagious enthusiasm for the Louisiana iris, and he produced several hybrids. He was a Fellow of the American Camellia Society, recipient of the Herbert Medal, recipient of the American Horticultural Society in 1964 (citation), recipient of Silver Seal of the National Council of State Garden Clubs, 1958, and Research Director of the Louisiana Society for Horticultural Research.

Ike is widely recognized for his plant exploration trips, the naming and/or introducing to cultivation of *Amaryllis evansiae*, *A. starkii*, *Chilidanthus boliviensis*, *Habranthus cardenansiana*, and the red Bolivian passion flower *Passiflora coccinea.* He was actively engaged in hybridizing *Amaryllis* species and cultivars. Numerous seedlings, as yet not evaluated or flowered, will be released by the University in the future as a living tribute to this renowned horticulturist.

He was instrumental in building and developing one of the finest collegiate ornamental horticulture centers in the South. This center now bears his name.

Professor Nelson devoted 25 years of his energetic life to teaching, counseling and advising young men and women at Southwestern. His total influence on the lives of these many students can never be fully estimated.

He is survived by his wife, the former Barbara Furnass, and four children, Martha, Leah, Katherine and Jimmy.

August 5, 1966, *James A. Foret*
University of Southwestern Louisiana,
Lafayette, La.

JOHN WILLIAM FRANCIS HARRISON, 1901-1966

Mrs. Morris Clint, *Texas*

William John Francis Harrison was born June 21, 1901 in Baysville, Muscoca, Ontario. He was known to his many friends as Frank (for Francis) Harrison. In 1912, he moved with his family to the city of Chatham, in southern Ontario. After completing his elementary education, he entered Chatham Collegiate Institute. Due to the manpower shortage, he worked for a nurseryman and florist during the last two summers of World War I. After his graduation from the Institute in 1918 or 1919, he continued to work full time in this position.

Even as a small boy, Frank was keenly interested in nature. He was a proficient fisherman, loved animals and was almost obsessed with all kinds of plant life. He not only brought home from the woods and planted many plants and trees, but was always ordering rare seeds from nurseries in the United States. He must have been born with a green thumb, for he was apparently more than successful in coaxing these rarities to grow and thrive.

He was an avid reader and was fortunate in having lots of material both in his home and in the Public Library. No doubt this extensive reading fostered the wanderlust that hit him about 1923. He worked in California for 18 months on the viaduct then being built to provide water for the city of Los Angeles. He returned to Canada in 1925 for a visit with his family and then set out for Mexico.

Whether he traveled over Mexico before settling down is not clear. I do know that in the course of his life there he saw a good part of Mexico. He first settled in the town of Chamal, in the state of Tamaulipas, where there was quite a large American colony. He taught school there and started a fruit farm in one of the nearby valleys. Disaster struck in 1933. In September of that year a severe hurricane destroyed his farm and he contracted a debilitating form of Malaria. His health began to fail and he was advised by his doctor to move to a higher elevation.

In 1935, Frank bought about 60 hectares of land on Cerro del Tigre, in the Sierra de Cucharas, about 8 miles west of Gomez Farias, Tamaulipas, just a few miles south of the Tropic of Cancer, and settled down in the fairyland he called ''Rancho del Cielo.'' He planted a few fruit trees (apples, pears, peaches and plums, since it was too cool for the more tropical fruits such as bananas, Avacado and Mango, which were raised in quantity around Gomez Farias), bought a few cows, and built himself a rough cabin and a small lath house for his rare plants and seedlings. For his livelihood, he sold fruit and milk (and later Amaryllis bulbs) to the local people. Just when he became so interested in *Amaryllis* is not clear—nor where he acquired his original start of bulbs—but I would guess that it was not long after he moved to the mountains. I do know that he periodically visited nurseries in Cuidad Victoria and other cities of Mexico, ordered seeds from this country and from Holland, and was furnished seeds and pollen by friends in the United States. It was not long before he had a good stock of bulbs, for his seedlings matured very quickly. From the beginning, he was careful to rogue out the "corrientes" as he called his inferior clones, and he worked continuously on improving the quality and color range of his strain.

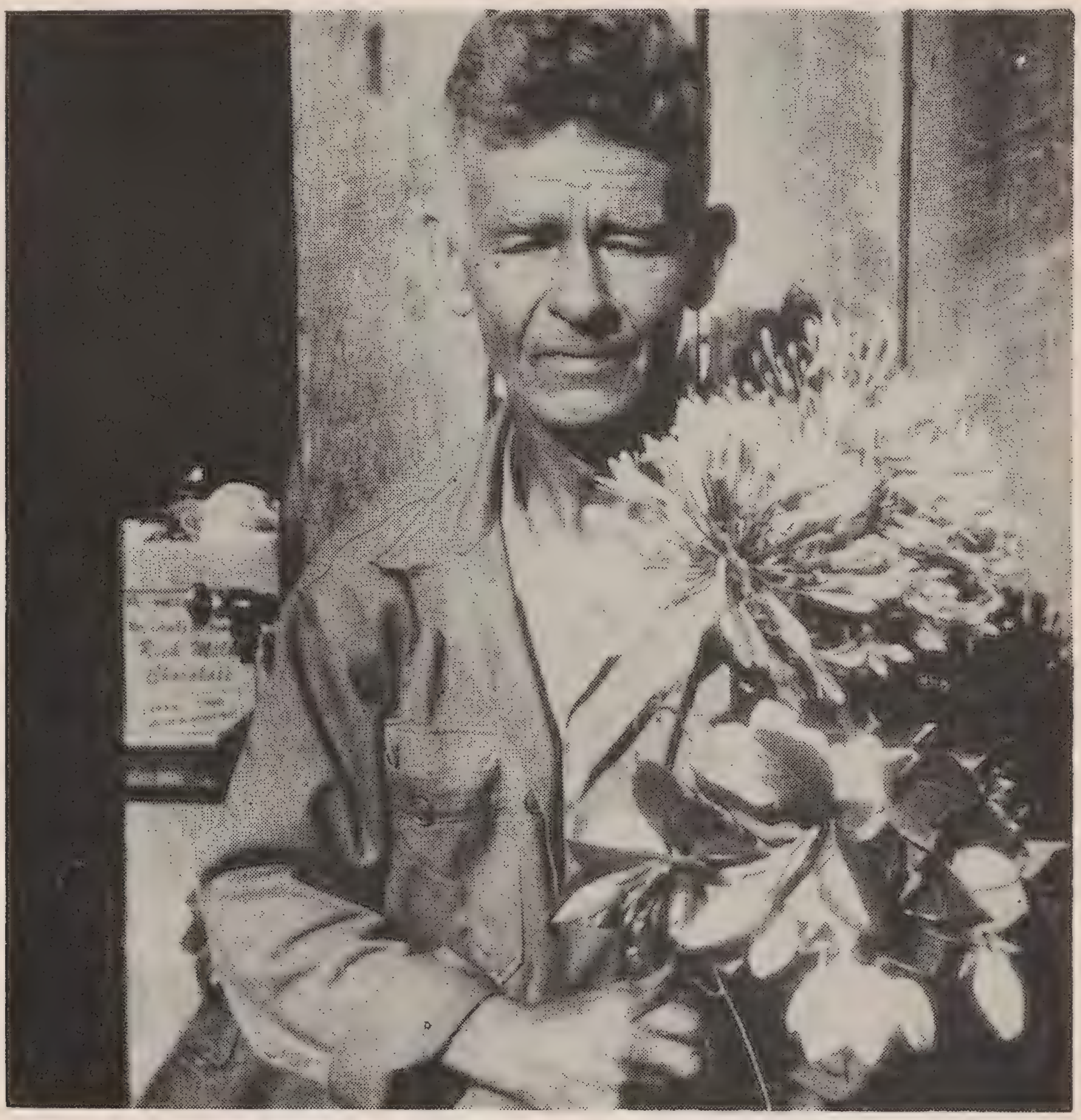

Fig. 2. Frank Harrison with bouquet of **Agapanthus** from his garden and **Magnolia** blossoms from the surrounding forest. Photo by Mrs. Barbara Warburton.

I don't know just when the first group of American scientists visited Frank, but it was probably during the 1940s. In any event, the word soon spread and Frank was forced to build a guest house for these visiting dignitaries. Later, a second and larger cabin was built. This unique area is a bonanza for students of all the natural sciences: its strange mixture of tropical and temperate plant genera and species whose area of distribution lie far to the south or far to the north, its rare and abundant wild life of all kinds, its unusual geological formation and its wealth of Indian mounds. Frank was much more than a competent guide for the area, for the mountain was an open book to him. He knew which barranca was the home of a certain rare new species of Echeveria or what cave housed a strange species of bat or where to look for the best Indian mounds. He was to learn much from the scientists, also. Incidently, the first rule one must learn at Rancho del Cielo was never to venture alone into the forest, even for a few yards, for fear of getting lost.

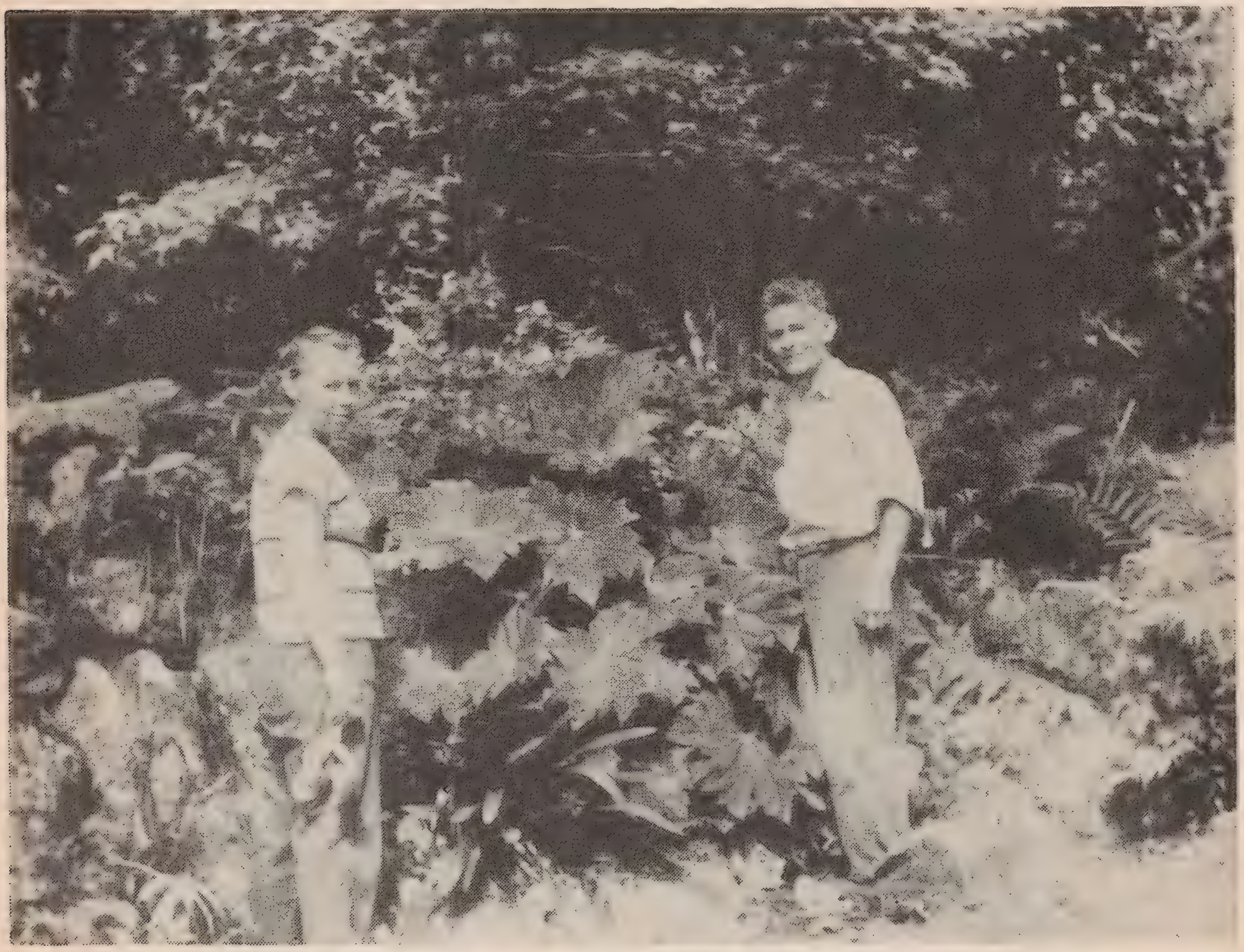

Fig. 3. Mrs. Betty McInnis and Frank Harrison showing part of rock fence and one of Frank's Begonias; taken at Rancho del Cielo; February 1960.

Although Frank kept busy and made many friends on the mountain, it must have been a very lonesome life until Fred and Katherine Blesse of Brownsville leased a small piece of land on the clearing near Frank's cabin and built a rough but comfortable cabin where they spent more than half the year. This was about 1951. It was through the Blesses and their guests that we first began to hear about Frank's mountain paradise, his Amaryllis and Frank, himself. We soon connected him with the W. F. Harrison who had written on growing Amaryllis in Mexico in Herbertia, Volume 14, page 23.

In 1955, a small group of hunters and sportsmen from Brownsville built another cabin on Frank's ranch. Among them were Gordon and Betty McInnis, of Brownsville, who fell in love with "The Mountain" and soon became fast friends with Frank. Other frequent visitors were John and Carolyn Hunter, also of Brownsville. It was through these two couples that we met Frank. We found him to be a very unusual person—quiet and unassuming, he was one of the most genuine persons I have ever met, generous to a fault, kindness itself. He never quarreled or raised his voice and disliked hearing others do so. If sharp words broke out in camp, he would slip quietly away, mumbling something like "got to see about a cow". Meantime, Frank became a frequent visitor in Brownsville. Every Christmas and usually once or twice more during each year he was in Brownsville visiting one or more of his friends.

On numerous occasions, we were urged to make trips to the mountain but to be truthful the hard grueling trip up the mountain by Jeep (at least 2 or 3 hours to cover 8-10 miles) scared us off for quite a while. In addition, we thought there surely must be a touch of exaggeration to the stories of the beauty and charm of Rancho del Cielo. Finally, however, a trip was arranged with John and Carolyn Hunter for the weekend of January 28th, 1957. We have traveled widely over Mexico and have seen many beautiful and interesting places, but from the moment we forded the Rio Sabinas, at the foot of the mountain, we found ourselves in another world. Although someone more gifted with words than I could paint an accurate picture of the place and a movie camera could capture much of it on color film neither could reveal the fascination and charm of the place. The trees are tremendous, from 60 to 130 feet tall, with trunks towering up to 90 feet or more before branching and up to 9 feet in diameter at the base. A species of Red Bud was in bloom, but so high in the sky that we could only get glimpses of them at times in the distance. The lower vegetation was covered with a pale green moss, giving the most eerie effect. Magnificent specimens of *Begonia heracleifolia* were in bloom among the large rocks on either side of the road, with flower trusses often 5 to 6 feet tall. There were large stands of the same tall, black-stemmed, upright maidenhair fern which had so enchanted us at Xilitla, far to the south. John pointed out large tree ferns, which we had so far never seen in the wild and certainly did not expect to find this far north. A beautiful *Chamaedorea* palm was so graceful that we thought at first it was the lovely narrow-leaved *Ceratozamia* species native to Frank's mountain.

The trip up the mountain had taken a long 5 hours, for we had gotten lost several times, and Rancho del Cielo was a welcome sight. The Amaryllis field was a blaze of color. We were pleased at the overall fine quality of the flowers and found the vigor of the bulbs amazing. Each clone had formed a huge clump of bulbs—a characteristic which makes them invaluable for garden planting, and prolongs the blooming period. We understand that Frank's *Amaryllis* bloom from late January into May. We had been so busy looking at the *Amaryllis* blossoms that we did not see the Freesias until Frank called our attention to them. They had naturalized all over the field! *Lilium formosanum* had escaped and was established all over the clearing and was even invading the forest. I believe Frank said they bloomed off and on over the year. Frank's *Sprekelia* in two forms were blooming with abandon and *Watsonia* in several shades were a beautiful sight. When we mentioned the *Begonia* we had seen coming up the mountain, Frank proudly showed us his hybrid of this species, which was a much superior plant with larger flower trusses and flowers of a much deeper color. Frank was also interested in *Gloxinia* and grew these to perfection in his lath house. As we walked around, we noted that the trees were lavishly decorated with bromeliads and Orchids of all kinds. We were astonished to find that when any of these epiphytes were dislodged from a tree, they continued to grow on the ground, which is most unusual. The general landscaping now includes *Fuchsia, Azalea, Camellia, Gardenia, Calla (Zantederhia)* and *Agapanthus,* all of which thrive and bloom beautifully. *Cymbidium* Orchids have been mass planted along one of the rock fences. *Impatiens* and Chinese forget-me-not re-seed and bloom almost all year. *Gladiolus* and *Gloriosa* have both naturalized. Guava and Orange trees supplement the fruit supply and there is now a large black walnut tree. Many of these plants Frank raised from seed.

Frank's ranch is situated on a uneven limestone plateau with an elevation of 3500 feet. Cerro del Tigre continues to rise north west of the ranch to an ultimate height of around 8000 feet, thus protecting the property from most of the northers during the winter. Until 1951, when the temperature got down to 23 degrees, his lowest temperature was only 28. The geological formation of this Sierra is unusual, for it is a mass of ''tumbled'' limestone with literally no bottom. There are numerous sink holes and many caves. Rancho del Cielo has one of the few good springs on this strange mountain of few springs and no creeks. Since the annual rainfall is from 70 to 130 inches, we have often wondered what happened to all of this water. I believe we solved the mystery a few years after our visit there when we saw the tremendous underground river which roars out of the mountain near Cuidad Mante, some 35 miles or so to the south, and furnishes irrigation to the lush farming area for miles around. The unique forest of Sierra de Cucharas is the most northern representative of the middle American cloud forest formation, and reaches a peak on or near Rancho del Cielo. Areas on either side of the Sierra are very dry and desert-like. On or near Frank's place there are at least 5 species of oak, 2 of red bud, hickory, Podocarpus, beech, maple, Magnolia, sweet gum, and many others. Several species of pine start around 5000 feet.

Mr. Hunter bought the Blesse cottage after Mr. Blesse's death. He is one of the trustees for Texas Southmost College, of Brownsville, so it rather naturally followed that small groups of students were frequently invited down for week-end laboratory study. About 2 years ago, 3 buildings were erected for an Ecological Station by the College on land leased from Frank. The venture was so successful that Frank expressed a desire to will all of his property to the College so that it would be preserved and always available for research. Since this was legally impossible in Mexico, lawyers advised the formation of a non-profit corporation under Mexican law for the purpose of holding the property for educational use. The corporation was duly formed and in July, 1965, Frank deeded his land to the corporation, reserving active control of the entire property for as long as he lived. Frank was extremely happy over the transaction. I shall quote several passages from a letter by John Hunter to one of Frank's sisters, Mrs. Nellie McKay: ''Frank wanted to have the property accurately surveyed and the week of January 24th (1966) a party of students and two professors from the College took down the official surveyor from Cuidad Victoria and ran the lines and established the corner markers officially. I was not present but the professors told me that Frank remarked that he was happy that this had been done as he felt that 'time is running out with me'.'' Poor Frank, it was, indeed.

JOHN WILLIAM FRANCIS HARRISON

BORN BAYSVILLE ONTARIO CANADA JUNE 21 1901
MURDERED RANCHO DEL CIELO MEXICO JAN 29 1966

A SINCERE STUDENT AND GIFTED TEACHER

TO HIM WHO IN THE LOVE OF NATURE HOLDS
COMMUNION WITH HER VISIBLE FORMS

The College party left Rancho del Cielo between 6 and 7 o'clock on the morning of January 29. Frank had breakfast with them and, as they drove off, left for his cabin to do the morning chores. Shortly afterward, he was waylaid and brutally murdered. The shocking news reached Brownsville about 10 o'clock Monday morning and by 1 o'clock a large party left for Mexico, carrying a casket with them. Various legal formalities and necessary arrangements were finally completed and

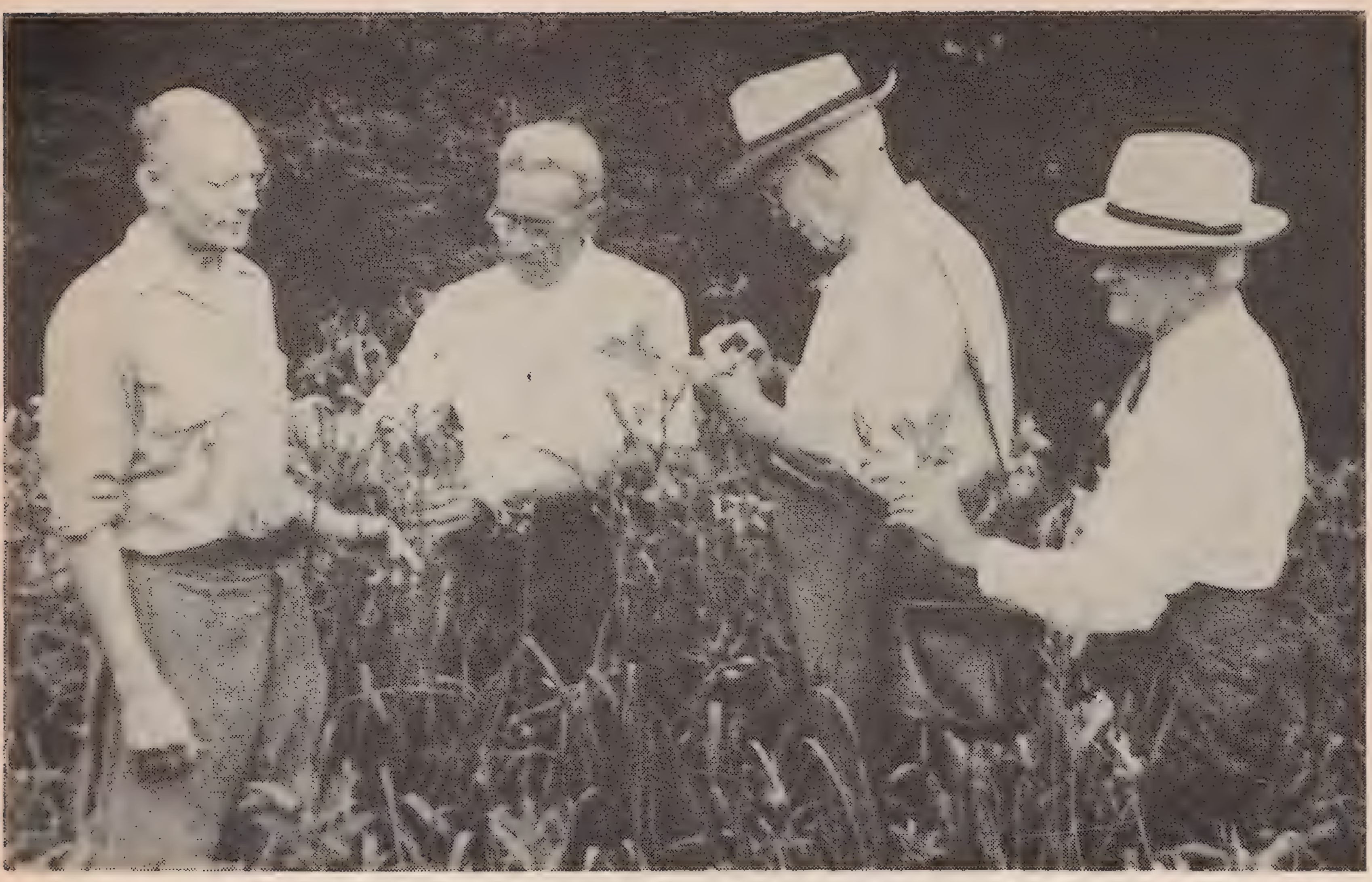

Fig. 5. Dr. Cooley, Mr. Olivet, Dr. Norton and Prof. Ballard inspecting hybrid **Hemerocallis** seedlings in the Washington-Maryland area. Photo by Mrs. Ben H. Nicolet.

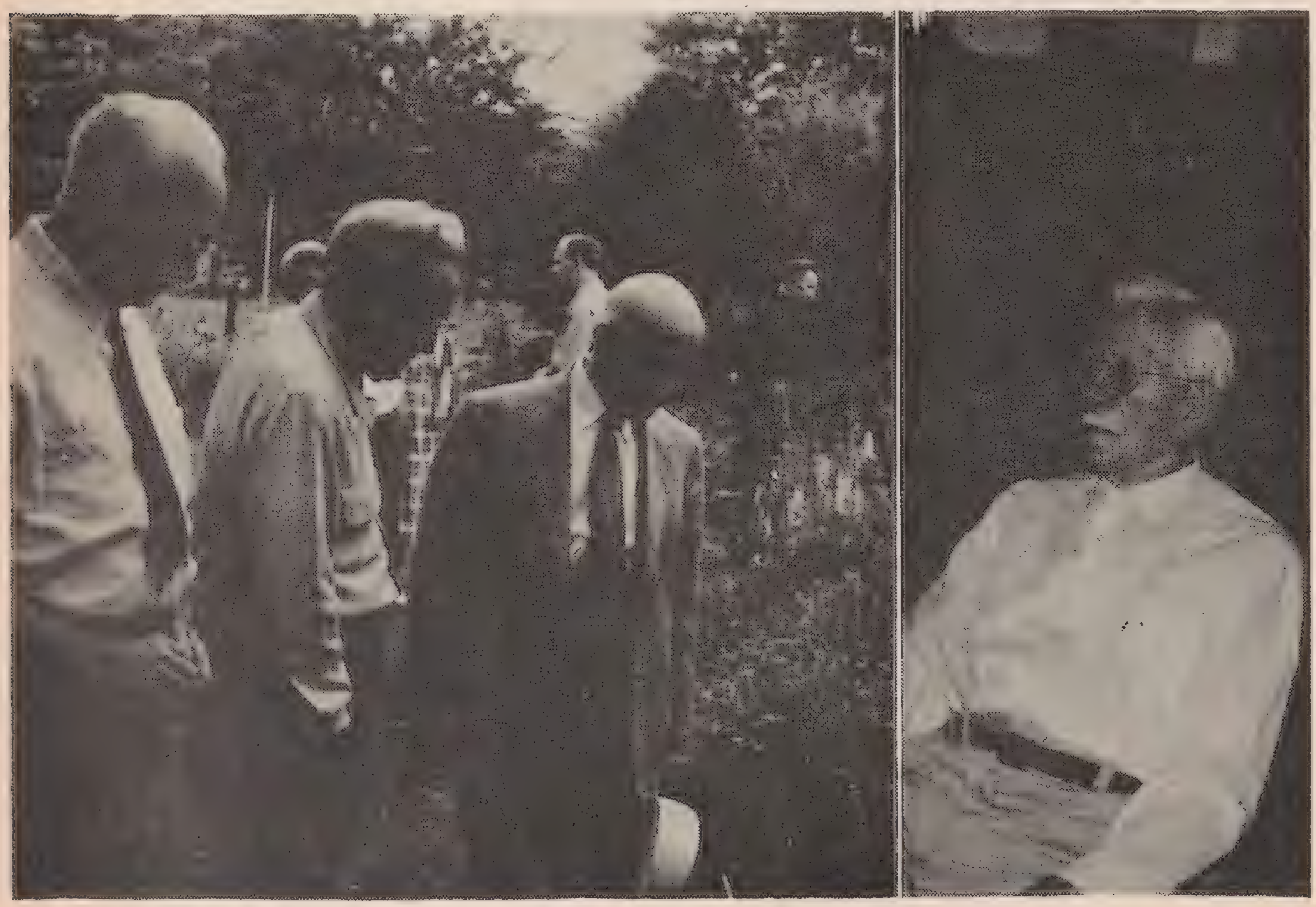

Fig. 6. Left, Dr. Henry A. Jones, Mr. Olivet and Prof. Ballard inspecting hybrid **Hemerocallis** seedlings in the Washington-Maryland area. Right, Dr. John B. S. Norton at the Age of 94 years in 1966. Photos by Mrs. Ben H. Nicolet.

Frank was buried late Tuesday afternoon February 1st "directly in front of the main College building in one of the old Indian mounds that are so abundant on the mountain . . . the location is a beautiful spot. I know he will be an inspiration to many students for years to come."

The Mexican police did excellent work on the case. Within a few days they had arrested two suspects, found an eye witness, and obtained complete confessions. In less than a week they had rounded up the rest of the troublesome group. They were members of an extreme left wing section of the Agrarian movement who had been "squatting" on land close to Frank's ranch. They blamed Frank for the eviction notices which had been served on them that week by the authorities. Under Mexican law, Agrarians have no right to claim land used for educational purposes.

As a final tribute to the memory of a very fine person, I again quote from Mr. Hunter's letter: "I have often thought about the remarkable character of the man who could move into an absolutely secluded spot and over a period of 30 or 35 years build as many friendships as widely scattered and as closely felt as Frank was able to do. I have no man in my acquaintance who has the friends that he had."

EARLY HEMEROCALLIS BREEDERS IN THE WASHINGTON AREA

Mrs. Ben H. Nicolet, *4603 Tuckerman St., Riverdale, Md. 20840*

In the 1930's, I functioned as chauffeur in transporting Dr. John B. S. Norton on many field trips, including trips to the gardens of daylily breeders—including the gardens of Dr. Cooley, Dr. Schott, Mr. Olivet, Prof. Ballard, Dr. Traub's daylily plots at the U. S. Station at Beltsville, and other breeders in the Washington, D. C. area. These are happy memories.

I purchased the brilliant red daylily, 'Berwyn' from Dr. Cooley for $6.00 who was propagating daylilies at that time. This was as much of a plunge for me then as the purchase of a $25.00 clone is to me today. As I progressed with the times, I tried to keep samples of the old daylilies for history's sake, but I lost many of these last summer when the teenagers who do my garden work cleaned out the Bermuda grass that grew high while the drought dried down the daylily foliage. One of my favorites was 'Victory Taierschwang' and I had it in a setting of a lacy variety of "Dusty Miller". I felt that it had some fine qualities and had I been breeding daylilies, I would have tried to carry on its superb ability to withstand adversities of heat and storm and still remain unmarked and velvety.

Recently, some one had reported that Dr. Norton was ill, and I went to see him in February 1966. I send you proof that he wears his years handsomely. (Fig. 6.) I believe he is nearing 95 years. He is alert and talks well, but says he promptly forgets all temporary things while the most minute details of the past stay in his mind. [Dr. Norton died July 12, 1966.]

I enjoyed the California visit, including the visit to the fine spot on the Pacific where Dr. Traub lives. Our winter (1965-66) here in Maryland has been kind and after my return, the garden was brought into order. My species *Crocus* are now blooming, and I am considering the purchase of more daylilies.

IN MEMORIAM—MRS. EMMA LOUISE DAVIS HAYWARD

Mrs. Emma Louise Davis Hayward, 94, mother of Wyndham Hayward, Winter Park Horticulturist, died February 2, 1966, at an Orlando Nursing Home after a long illness. Mrs. Hayward was born in Providence, R. I., in 1871, the daughter of Henry Richard Davis who for more than half a century was secretary-treasurer of the Providence Journal Company. Her husband, Walter Hayward, who died in 1919, was on the editorial staff of the Journal. Before coming to Orlando in 1927, Mrs. Hayward was prominent in horticultural, civic and welfare work in Wickford, R. I., activities which she continued at her new home in Winter Park, Florida.

EDITOR'S MAIL BAG

The Secretary of the Royal Horticultural Society of London informed us under date of May 3, 1966, that Mr. H. W. Pugsley, the noted authority on *Narcissus*, and Herbert Medalist, died on November 18th, 1947, aged 79; and that an In Memoriam notice appeared on page 200 of the Gardeners Chronicle for December of 1947. The members will want to reread Mr. Pugsley's autobiography which appeared in Herbertia 7: 35-36, with portrait (plate 172). 1940.

Mr. Horace Anderson, 400 La Costa Av., Leucadia, Calif. 92024, an outstanding horticulturist and nurseryman, and authority on cycads has been appointed chairman of the Cycadaceae and Alstromerid Committees.

Mr. Wyndham Hayward writes under date of July 1, 1966, that he has sold his property in Winter Park, Florida, to the Presbyterian Church, which has erected a three million dollar retirement home in the Gentile Grove to the South. They will allow Mr. Hayward to live on his property for one additional year.

Dr. John B. S. Norton, 94, professor emeritus, University of Maryland, and specialist in plant pathology and plant lineagics, died July 12, 1966. See Fig. 6. Dr. Norton retired in 1942, and lived at 4922 40th Place, Hyattsville, Maryland. His many friends will greatly miss him.

Under date of October, 1966, Tucuman, Argentina, Mr. Leonard Doran, who is on a plant exploration trip in company with his mother, writes that he expects to find *Amaryllis* and other amaryllids in this area.

Mr. J. Leonard Doran, and his mother, Mrs. Cora B. Doran, 1117 N. Beachwood, Burbank, Calif. visited with the editor on Nov. 9, 1966.

They had recently returned from a plant exploration trip into South America as far down as Argentina.

1. REGIONAL ACTIVITY AND EXHIBITIONS

THE 1966 AMARYLLIS SHOWS

The Official Amaryllis Shows for the year 1966 began on March 27 with the Coastal Bend Amaryllis Show, Corpus Christi, Texas. Then followed the Official Men's Amaryllis Club Show, New Orleans, La., on April 16 and 17; the Official Show of the Greater Houston Amaryllis Club on April 17, and the Official Show of the Southern California Hemerocallis and Amaryllis Show.

Mrs. Sam Forbert, President, writes that the Hattiesburg, Miss., Amaryllis Society Show had to be canceled due to several factors, mainly the premature blooming of most of the bulbs, but they are planning for a quality show in 1967. Mrs. A. C. Pickard reports that the Houston Amaryllis Society Show was canceled due to unseasonably cold weather and excessive rainfall, which resulted in inferior blooms; and that they are looking forward to an excellent show for 1967. No reports have been received from the managers of Greater Gulf Amaryllis Show, and the New Orleans Garden Circle's Amaryllis Show, and it is assumed that these shows were canceled due to unfavorable weather.

COASTAL BEND AMARYLLIS SHOW, 1966

Mrs. Carl C. Henny, *President, P. O. Box 3054, Corpus Christi, Texas*

The Coastal Bend Amaryllis Society held its seventh annual Amaryllis Exhibit in conjunction with the Lola Forrester Flower Show which was held in the Exposition Hall March 26th and 27th, 1966. Due to a cold winter and spring, with little rain and sun, and also due to the fact that the Lola Forrester Flower Show was held about two weeks too early this year, our Amaryllis Exhibit was very small, with only 15 entries. Two of these were cut scapes and 13 were potted amaryllis. Just now (Apr. 11) many of our garden grown amaryllis are in bloom.

Among the Pot Grown Registered Leopoldi Type Amaryllis entered were: 'Apple Blossom', 'Royal Dutch', 'Boquet', 'Ludwig's Dazzler', 'Daintiness', 'Fire Dance' and 'Picotee'. Mrs. R. A. Hornberger, club member, received a blue ribbon on her pot grown 'Apple Blossom' and a yellow ribbon on her pot grown 'Royal Dutch' Amaryllis.

Mrs. Carl Henny received a blue ribbon on her cut scape American variety seedling.

Mr. R. L. Retallack received a yellow ribbon on his pot grown Belladona Type Amaryllis.

Mr. H. E. Lemoine received a blue ribbon on his pot grown ''Constant Comment'' Miniature Gracilis, and a red ribbon on his pot grown

'Pamela' Gracilis Amaryllis. Mrs. Levi Materne received a red ribbon on 'Sparkling Gem' Miniature Gracilis, pot grown.

Mrs. R. A. Hornberger, club member, scored 97 points on her 'Apple Blossom' pot grown amaryllis and was awarded the ''Ludwig Challenge Trophy''. Mr. S. C. Tumlinson, a non-member, received a blue ribbon and the ''Award of Merit'' Ribbon on his 'Daintiness' pot grown amaryllis, which scored 98 points.

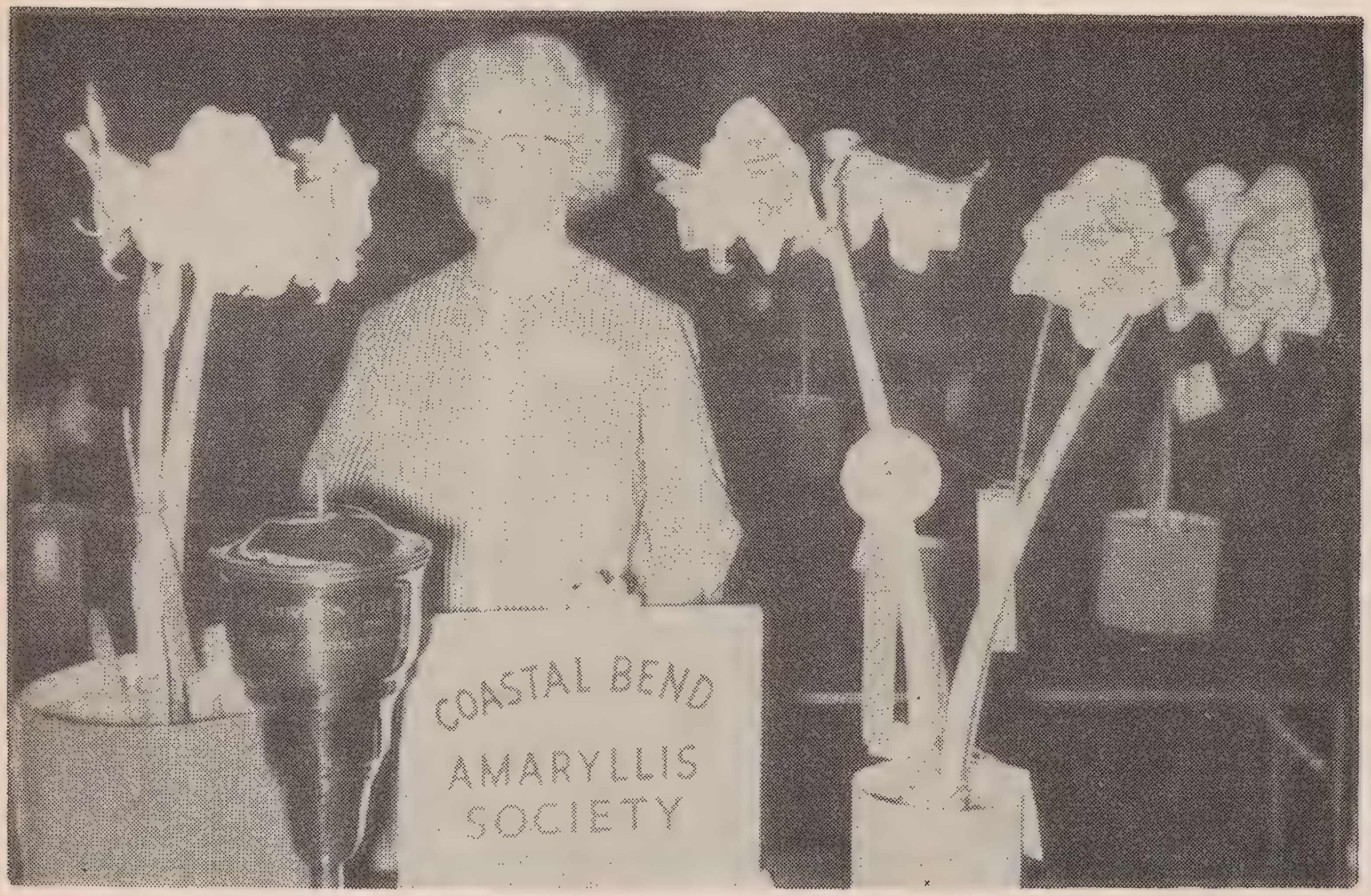

Fig. 7. Mrs. R. A. Hornberger received the ''Ludwig Challenge Trophy'' for her hybrid **Amaryllis** clone 'Apple Blossom' which scored 97 points.

Those receiving the American Plant Life Society ''Award of Merit'' were: Mrs. R. A. Hornberger, on ''Apple Blossom''; Mr. H. E. Lemoine, on ''Constant Comment'' Gracilis; and Mr. S. C. Tumlinson on ''Daintiness''.

Mr. Harvey Vogt planted amaryllis seeds and potted 80 seedlings which were distributed to those at the flower show who were interested in growing amaryllis.

Three Accredited National Amaryllis Judges from San Antonio, Mrs. Sam Montgomery, Mrs. Larry Miller and Mrs. Frank Hopwood, judged our Exhibit. Five blue ribbons, 4 red ribbons and 2 yellow ribbons were awarded, making a total of 11 ribbons awarded. The quality of the entries was good despite the small number of amaryllis exhibited.

I am enclosing a picture of Mrs. R. A. Hornberger with the Ludwig Challenge Trophy and the award winning pot grown amaryllis, ''Apple Blossom'' and ''Daintiness''.

OFFICIAL MEN'S AMARYLLIS CLUB OF NEW ORLEANS SHOW, 1966

James E. Mahan, *Show Standards Chairman,*
3028 Palmyra St., New Orleans, Louisiana 70119

The Men's Amaryllis Club of New Orleans, Inc., held its seventh Official, All Horticulture show on Saturday and Sunday, April 16th and 17th, 1966 at the Edward Hynes School in New Orleans. As in the past, attendance was quite representative, visitors having come from many neighboring cities and states; and the consistently high quality of the entries in competition was very gratifying to all.

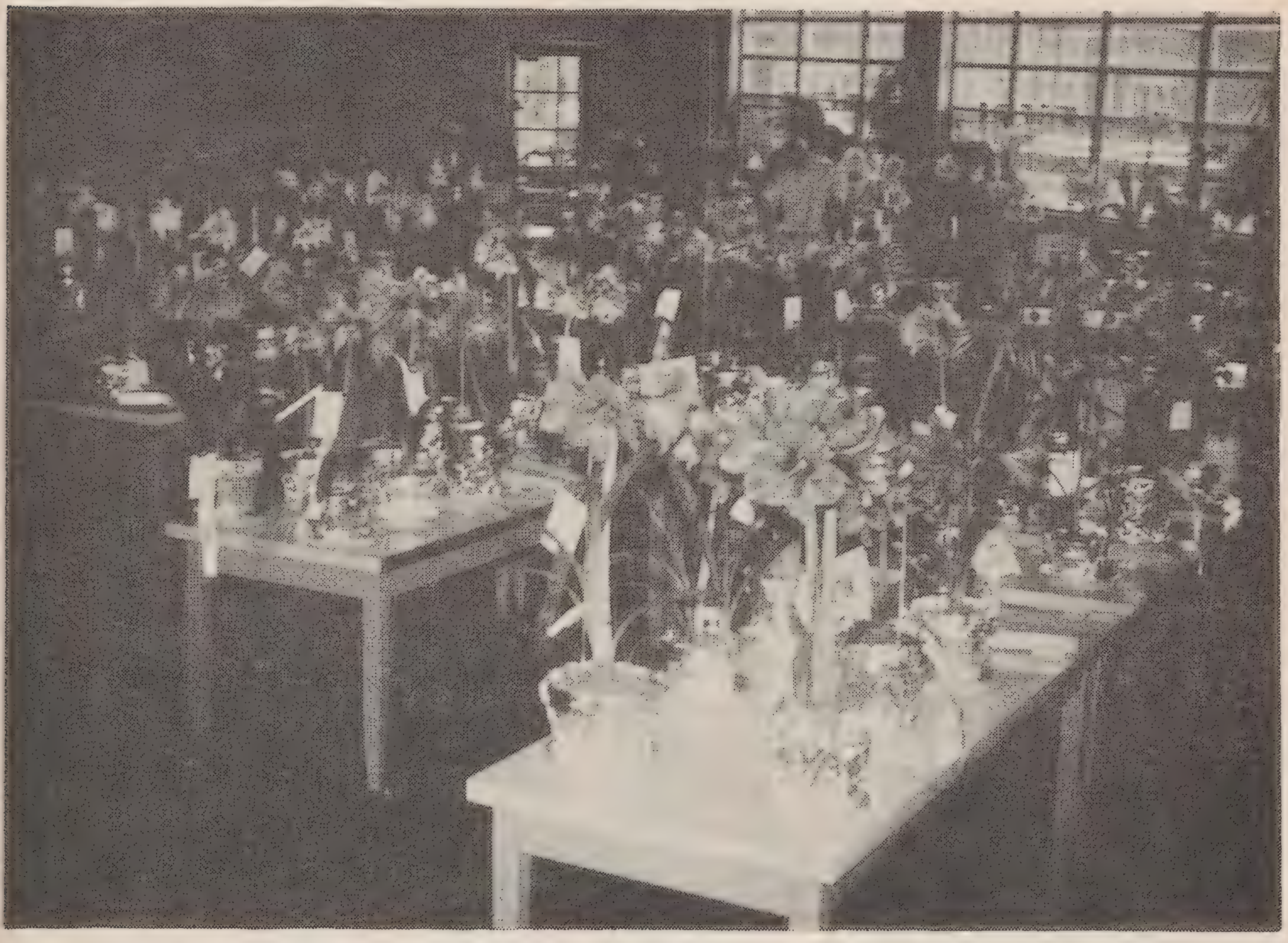

Fig. 8. Part of the exhibits at the 1966 Official Amaryllis Show staged by the Men's Amaryllis Clubs of New Orleans.

The show was staged this year according to the nine divisions as defined by the American Amaryllis Society with separate sections for Registered and Named, Unregistered and Unnamed, Species, and Unregistered but named specimens for both cut specimens and potted specimens. It was felt that this is a more realistic approach toward classification of the entries in contrast to classification according to country of origin as had been done in the past. The usual first, second, third and honorable ribbons were awarded along with trophies and sweepstakes ribbons for outstanding entries.

The following trophies and sweepstakes ribbons were awarded: the Walter Latapie Award for the best registered and named specimen to Mr. W. J. Perrin; the Rose Garden Center Award for the best unregistered and unnamed specimen to Mr. W. J. Perrin; the Alatex Construction Service, Inc. award for the best home-bred, grown and developed specimen, either registered and named or unregistered and unnamed to Mr. E. M. Beckham; the James Mahan award for sweepstakes winner in registered and named potted specimen to Mr. E. M. Beckham; the Reuter Seed Company, Inc. award for sweepstakes winner in unregistered and unnamed potted specimen to Mr. E. M. Beckham; the Swetman Amaryllis Garden award to Mr. E. M. Beckham for the most blue ribbons in the registered and named sections, potted and cut scape specimens; the President's Trophy for the most blue ribbons won by a member of the Men's Amaryllis Club of New Orleans, Inc. to Mr. Milo Virgin; sweepstakes ribbon for most blue ribbons won in registered and named potted specimens to Mr. E. M. Beckham; sweepstakes ribbons for most blue ribbons won in unregistered and unnamed potted specimens to Mr. Milo Virgin; and a cup to the best single floret specimen entered in a special section open to members of the Men's Amaryllis Club of New Orleans, Inc. only, to Mr. Stephen Gasperecz.

Mr. Norman Clements acted as Show Chairman with Mr. W. C. Creevy as co-chairman and both discharged their duties admirably. Judging was done by nine accredited judges in three panels of three judges each and the thanks of the club go out to them for their very competent judging and attention to all entries.

An added attraction to the show this year was the setting up of two simulated garden beds in the entry hall to the show with the main attraction in the beds being, of course, amaryllis in bloom. Various other plants were included and even several small trees as a natural background for an outdoor amaryllis garden bed. Sides were built up along the perimeter of the bed with peat moss used as filler to simulate a garden soil. Comments were many and favorable on this idea conceived by our member, Mr. W. J. Perrin, and ably carried out by him with the assistance of member W. C. Creevy. It is hoped that this feature will be continued in future shows and perhaps even enlarged since it received such praise from the visiting public.

OFFICIAL SHOW OF THE GREATER HOUSTON AMARYLLIS CLUB, 1966

Mrs. Sally Fox, *Corresponding Secretary*

"Doublegood" is the most descriptive word to use when The Greater Houston Amaryllis Club had its annual official show in conjunction with The Mens Garden Club Spring Show. The show had been scheduled for April 17th, but due to cool nights and some overcast days the blooms did not develop sufficiently to warrant a show on that date. The Club asked the Mens Garden Club if they could join them the following Sunday, April 24th, when they held their Spring Show, and were welcomed enthusiastically to have their display in the adjoining Rose Room of The Garden Center.

Unfortunately the seven days were disastrous to gardens with high winds and continuous rain, and although brilliant blooms were displayed in a garden-like setting in the Rose Room to an overflow crowd, the Judges in line with their rules, were not able to give high enough scores to warrant the silver trophies. Only entries in three divisions scored 95 or better. Mrs. A. G. Horsfall won The Greater Houston Amaryllis Club silver trophy for best Dutch specimen in the show with a cut specimen ''Royal Dutch'', as well as an Award of Merit from The American Plant Life Society. She was awarded the Ludwig Challenge Cup for this same entry, which is given by the Holland hybridizer for the best Ludwig specimen. Kermit L. Warnasch scored 95 for a miniature ''Firefly'' but since there were only two entries in this class no trophy was given. Mrs. Charles H. Pease scored 97 for an Amaryllid species, but this too was the only entry in this division.

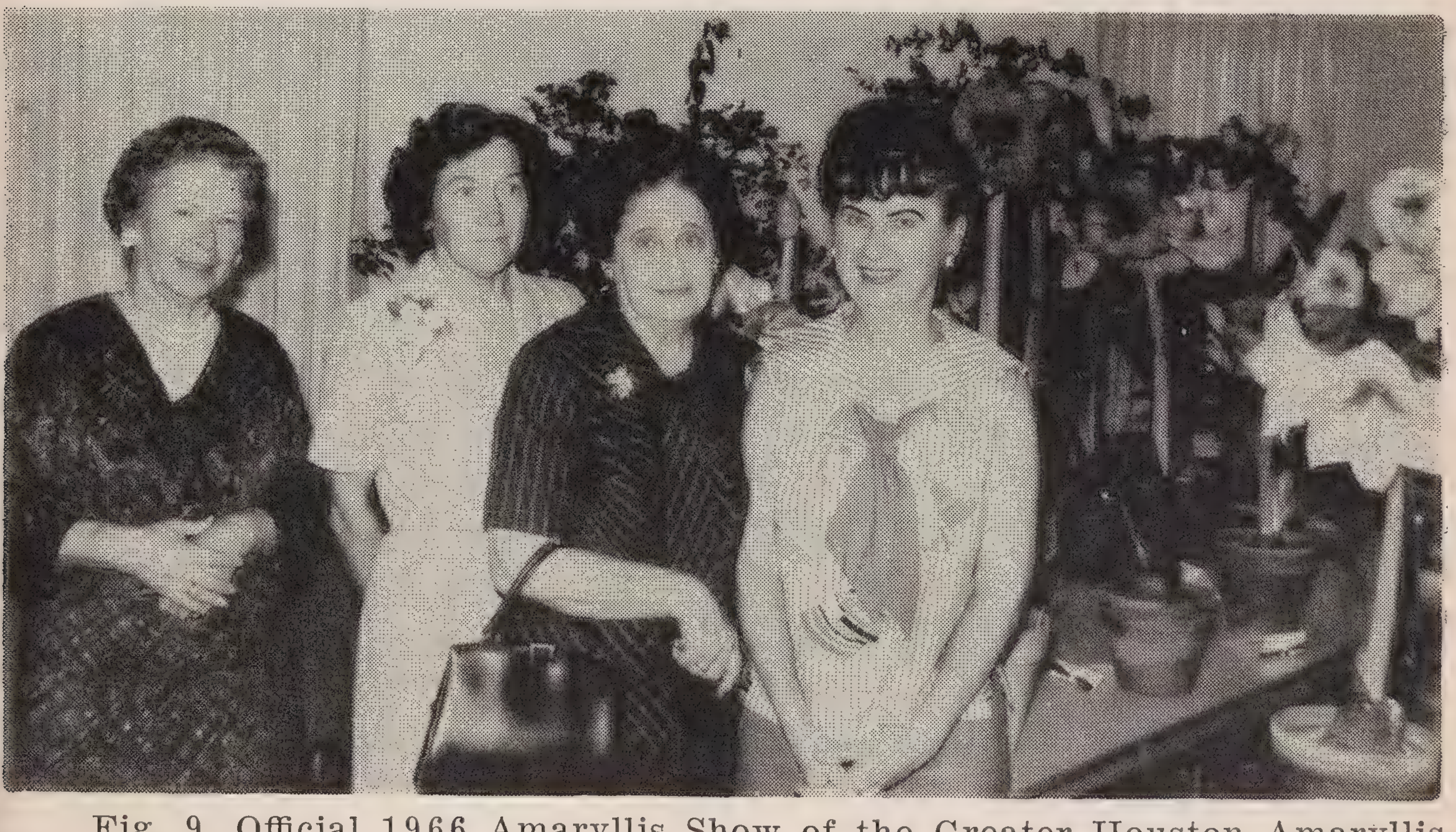

Fig. 9. Official 1966 Amaryllis Show of the Greater Houston Amaryllis Club: left to right, Mrs. A. G. Horsfall, Trophy winner; Mrs. Charles H. Pease, Staging Chairman, and Club President; Mrs. W. S. Wheeler, Vice-Chairman and 1966-67 President; and Mrs. Sally Fox, Show Chairman and 1966-67 Vice President.

Mrs. Charles H. Pease prepared the educational exhibit, which was most outstanding. She was quite pleased to answer numerous questions to interested guests.

Many new Amaryllis lovers were gained through this joint show, as the Mens Garden Club also has quite a number of Amaryllis growers who displayed beautiful specimens competing for the Ludwig Challenge Cup. Judges of the Amaryllis Division of the Mens Garden Club show selected "Apple Blossom", entered by Kermit L. Warnasch, as the best Ludwig specimen to win the Ludwig Challenge Cup. Mr. H. T. Long was a close second with White Christmas. Mr. Warnasch also won an Award of Merit for a magnificent specimen "Floriade" which was the showpiece of this division.

Mrs. Sally Fox was General Chairman, with Mrs. W. S. Wheeler as Vice Chairman. Both felt the event was well received as the visitors didn't notice the absence of the silver trophies since they were able to view many, many blue ribboned specimens.

Yes, it was a "Doublegood" event long to be remembered.

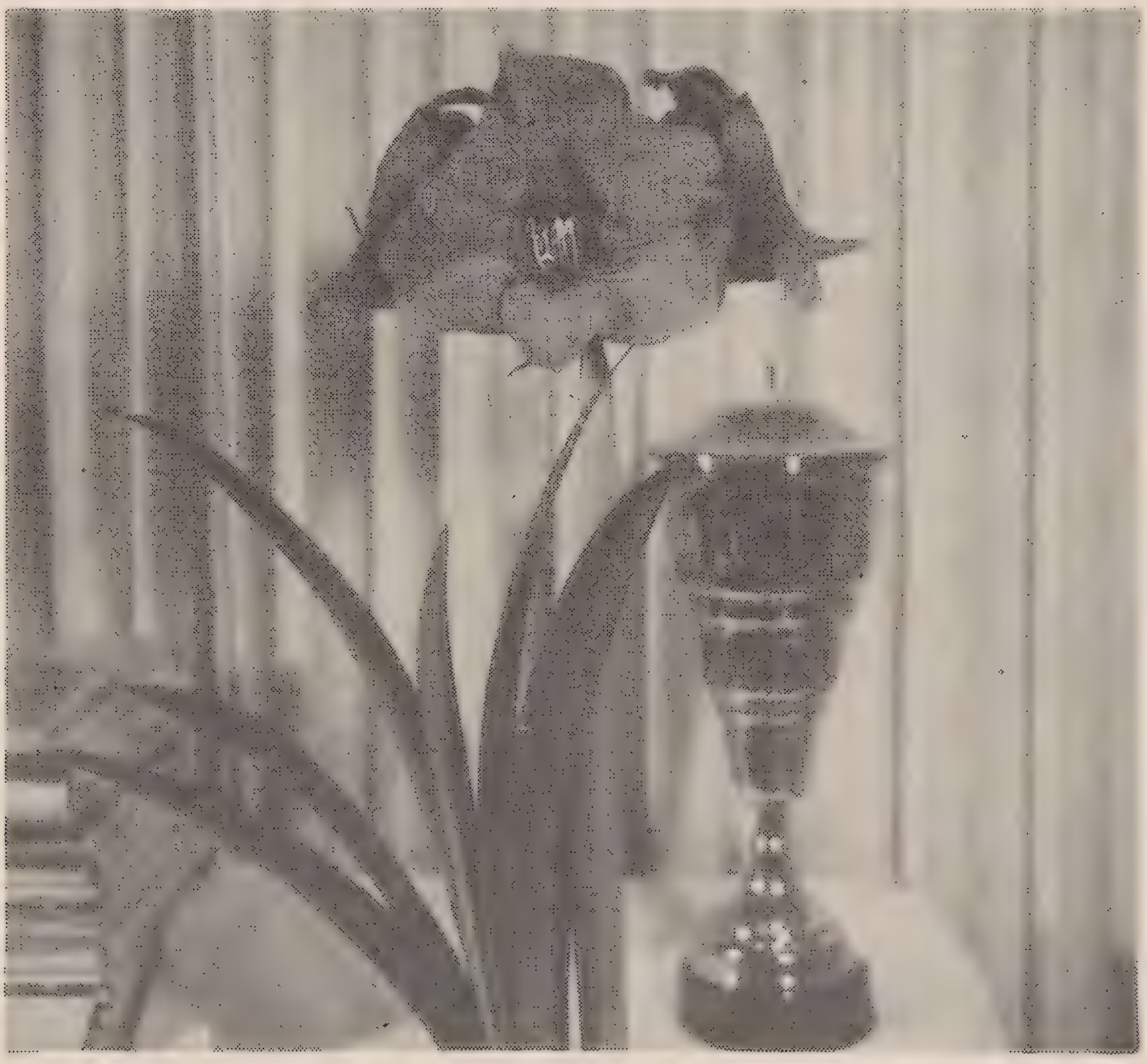

Fig. 10. 1966 Southern California Official Amaryllis Show: W. Quinn Buck's exhibit of hybrid **Amaryllis** clone 'Wyndham Hayward' for which he received the "Ludwig Challenge Trophy." Photo by Jack V. McCaskell

1966 SOUTHERN CALIFORNIA OFFICIAL AMARYLLIS SHOW

Mrs. Bert Williams, *Show Chairman,*

2601 La Presa, South San Gabriel, Calif. 91777

An Amaryllis Show far better than the preceding year's was held at the Los Angeles State and County Arboretum, 301 N. Baldwin Ave., Arcadia, Calif., on May 14 and 15, 1966, again sponsored by the Southern California Hemerocallis and Amaryllis Society. The show committee had spent anxious weeks preceding the show because the warmer spring had made so many growers report that their bulbs had all bloomed long before the show date. Everyone was happily surprised at the really fine array of spikes assembled, a big percentage coming from several large growers.

The whole lecture hall of the Arboretum was well filled with many tables for the seven divisions, which included cut spikes as well as potted material. There were 95 competing exhibits, in addition to the hundreds of non-competing displays. A special feature was the impressive group of amaryllis arrangements contributed by Chadwick Gardens, florists of Redondo Beach, Calif., who also displayed very high quality cut spikes, including some lovely pinks and picotees, as well as some superb potted seedlings.

Another special feature was the group of spikes of the Howard & Smith strain furnished by Paul J. Howard's California Flowerland, which is to be closed because of Mr. Howard's death in the spring. This may have been the last time that so many spikes from this famous strain will grace our show.

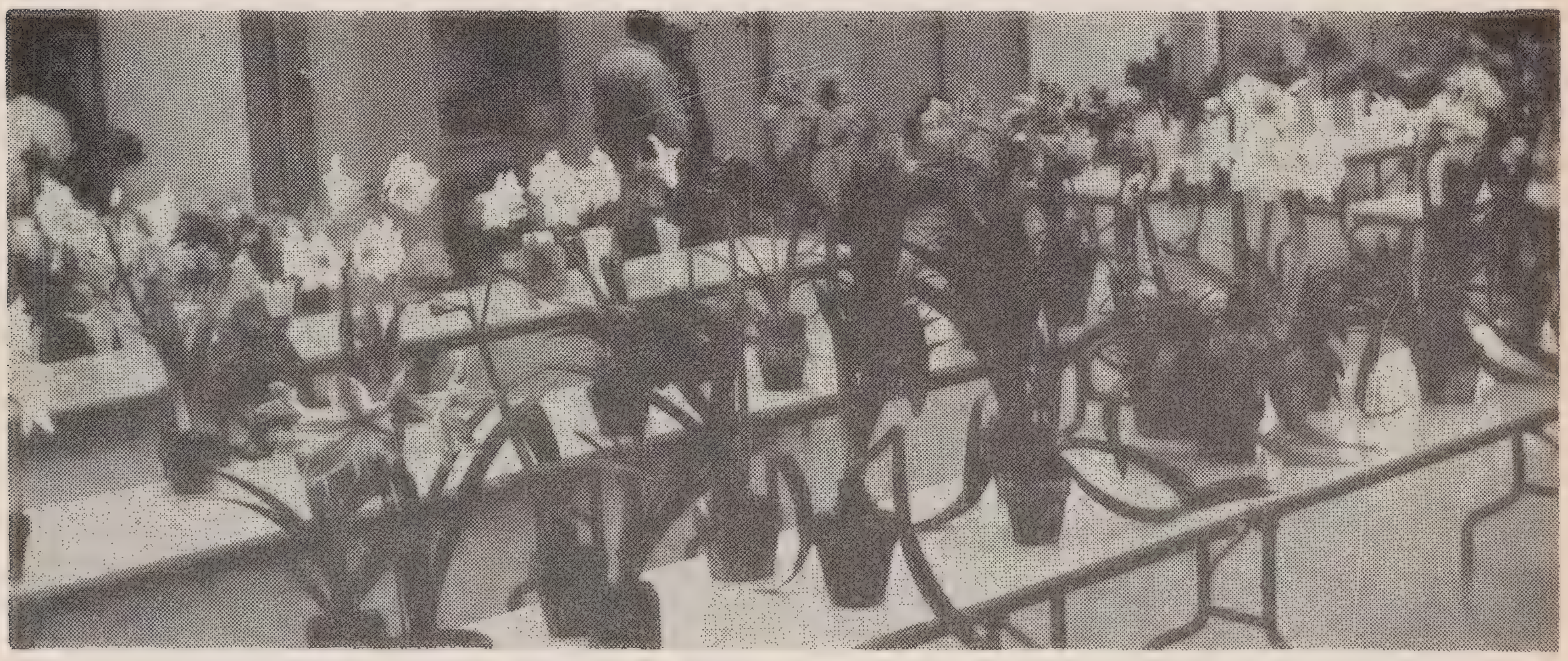

Fig. 11. 1966 Official Southern California Amaryllis Show: part of the exhibits. Photo by Jack V. McCaskell.

The Cecil Houdyshel Perpetual Memorial Trophy, a handsome silver Revere bowl, was awarded to Mr. W. Quinn Buck as the sweepstakes prize. Mr. Buck was given a small replica of the large Trophy for having won it at the 1965 show also.

The Ludwig Challenge Cup, a handsome trophy from Ludwig & Co., Hillegom, Holland, for award to the best specimen exhibited of one of their varieties making a score of not less than 95 points, went to Mr. W. Quinn Buck for his potted 'Wyndham Hayward', which the judges gave 98 points.

For the best single cut specimen a silver tray was awarded to Mrs. Eva Turnquist. Mr. Gilbert Nash was runner-up in this class with one of his fine cut spikes, and he received a copy of the Peggy Schulz book on Amaryllis culture.

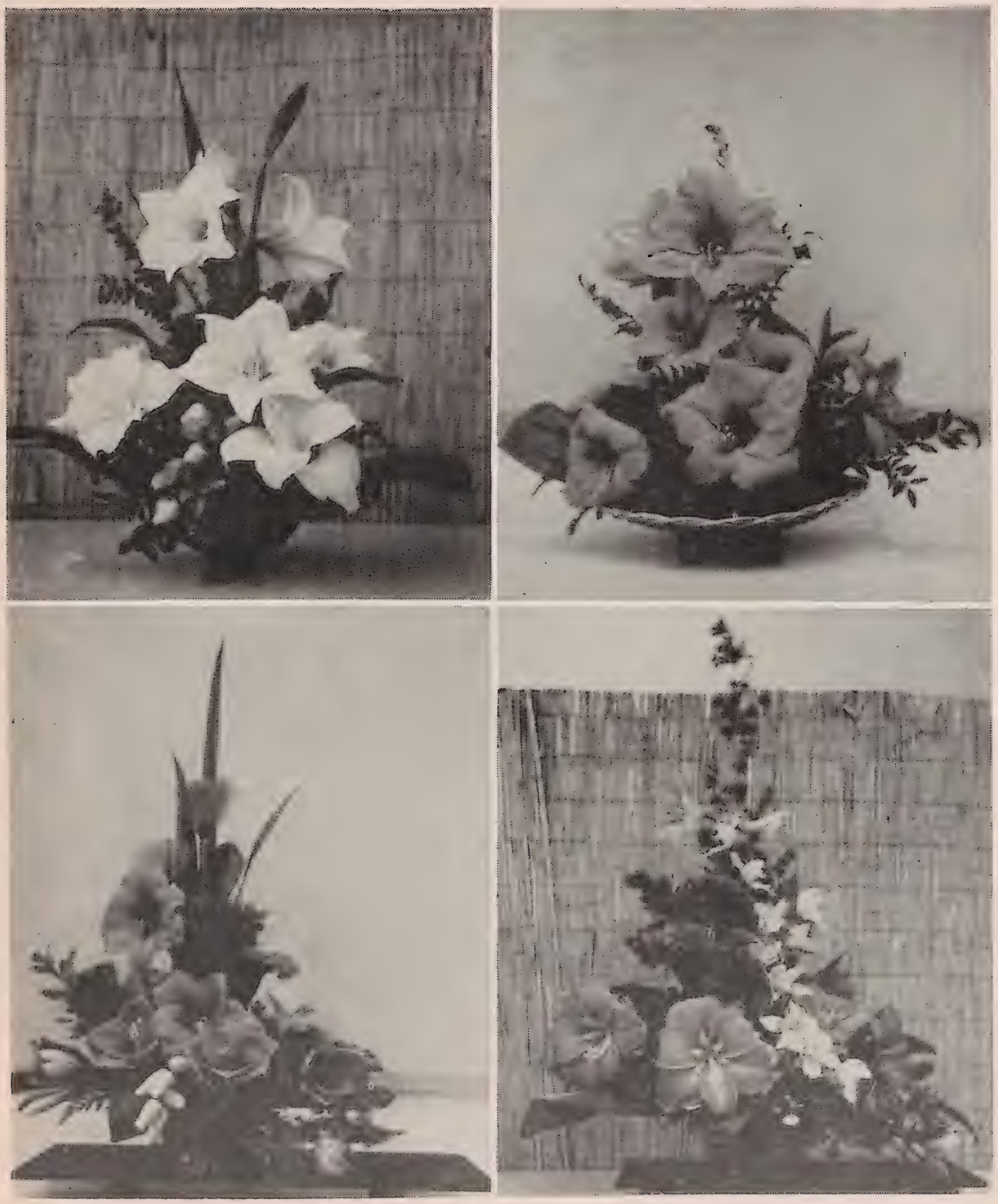

Fig. 12. 1966 Official Southern California Amaryllis Show: arrangements from Chadwick Gardens, Redondo Beach, Calif., **upper right** low flat bowl arrangement combining **Cymbidium** blooms with large salmon **Amaryllis** flowers; **upper left**, arrangement of picotee **Amaryllis** seedlings combined with several types of handsome foliage, accented with a cluster of pepper fruits; **lower left**, tall arrangement of salmon-scarlet **Amaryllis** and clipped **Cyperus** foliage, accented with peppers, and imported porcelain duck; **lower right**, tall arrangement of **Amaryllis** in harmonizing tones of rose-purple, combined with Cymbidiums and beautiful **Asparagus** foliage. The colors of the **Amaryllis** made this the most beautiful group in the show. Photos by Jack V. McCaskell.

Those winning most blue and purple first place ribbons were Mr. W. Quinn Buck, Mrs. Eva Turnquist, Mr. Sterling Harshbarger, Mr. Gilbert Nash, Mr. H. F. Colby, and Chadwick Gardens.

Two special awards were made, rosettes going to Mr. Leonard Doran for his bouquet of a beautiful *Zephyranthes* species collected in Peru on one of his trips; and to Chadwick Gardens in recognition of the great merit of their superlative amaryllis arrangements.

American Amaryllis Society awards included an Award of Merit to Mr. W. Quinn Buck for his specimen of 'Wyndham Hayward'; and Preliminary Commendations for meritorious seedlings exhibited went to Mr. Gilbert Nash, Mr. Sterling Harshbarger, and Mrs. Kenneth B. Anderson.

Three tables of daylily flowers were shown by W. Quinn Buck. The warmer spring weather had brought many of the earlier types into bloom by this date. Many fine large tetraploid seedlings were shown, and these were foiled by types with bold, dark eyes that made wonderful contrast.

HOUSTON AMARYLLIS SOCIETY

MRS. A. C. PICKARD, *Chairman, Official Show Standards*

The Houston Amaryllis Society show was cancelled for 1966 due to unseasonably cold weather and excessive rainfall. This resulted in inferior blooms throughout the blooming season.

As for the gardens, they are mostly small, though very distinct. All of them are large enough to contain a representative collection of the finest Dutch hybrid Amaryllis now available in the world.

When the gardening public can see the results of the ability of the bulbs to adapt themselves to adverse conditions, it is the best vehicle to demonstrate the quality for the exhibitor.

We are looking forward to a favorable Amaryllis Season in 1967 and to offering the public another official Amaryllis Show.

WHO JOINS THE AMARYLLIS ROUND ROBINS?

MRS. FRED FLICK, *Carthage, Indiana 46115*

People from many walks of life, and of many professions, have been, or are, members of the Amaryllis Round Robins.

There have been busy housewives and mothers who find time to grow their favorite flowers; a young lad of fourteen, who founded the Gloxinia Society, and grew up to become a magazine editor and author of horticultural books; the retired business man who has started a new business of growing and selling orchids; school teachers who grow flowers in their class rooms; a busy family man and eye doctor, who finds relaxation in caring for his flowers; the beautician who wrote a number of horticultural books; the young man in Texas, having earned his doctorate has come to an Indiana university to teach; the Canadian housewife who grows many flowers and vegetables; all ages and with varied interests, but all enjoy the beauty of the Amaryllis.

Members are lost due to various reasons; lost interest; old age; ill health and death. The first Amaryllis Robin was started twenty-five years ago with three members, only one of the three is still active; the present Robin director. At one time there were eleven very active Robins flying; at the present time there are five active Robins. Young members are needed at present, so that the Robins may be kept flying for another twenty-five years.

BEAUTY FOR THE BLIND

Mrs. Sally Fox, *Houston*

HAPPINESS is a Club Project! During the Spring of the 1964/65 year, a group from the Greater Houston Amaryllis Club, with Mrs. Jesse Haver as Chairman, took Amaryllis blossoms from their yards and visited the Lighthouse For The Blind, whose Garden Club membership is about twenty-eight members. Each Lighthouse member was given a blossom. Some members of the Lighthouse Club are blessed with a small amount of sight, where others must rely on their other senses. We felt the Amaryllis would be an ideal bulb in which to interest these handicapped persons since the blooms are unusually large, heavy textured, and often have a faint scent—and their sensitive fingers could behold the beauty of the amazing Amaryllis. After the meeting, refreshments were served by Mesdames R. A. Fawcett, T. L. Lawler, Glen Melton and Mrs. Haver.

The response was so enthusiastic that the Greater Houston Amaryllis Club voted to make this their Number Two Civic Project and began preparations for the next year.

October 19, 1965 was set aside for the 1965 meeting. Each member of the Greater Houston Amaryllis Club furnished a blooming size Amaryllis bulb, clay pots were furnished by the Club, and Mrs. Charles H. Pease prepared the proper potting soil. The Lighthouse members were assisted (where necessary) to pot these bulbs by Mesdames Frank S. Bova, Jesse Haver, A. G. Horsfall, Glen Melton and Charles H. Pease. The Lighthouse members then took them home to care for before and after blooming. They received growing hints, as well as after blossoming care suggestions with a great deal of interest.

The Lighthouse Club has monthly meetings, and we know every adjective in the book will be used when they describe to each other their little portion of BEAUTY FOR THE BLIND.

We hope this Number Two Project of our Club will be as rewarding to the Lighthouse Garden Club members as it is to our Club.

HERBERT MEDAL PRESENTED TO MR. BOSHOFF-MOSTERT

In a ceremony at the Kirstenbosch Gardens tea-room, Mr. Le Roux, Minister of Agricultural Technical Services, Republic of South Africa, presented the 1966 William Herbert Medal to Mr. Leon Boshoff-Mostert, February 3, 1966, on behalf of the American Plant Life Society. Among those present were the wife of the Prime Minister, and Mrs. Boshoff-Mostert. The reader is referred to the 1966 issue of the Amaryllis Year Book for the autobiography of Mr. Boshoff-Mostert.

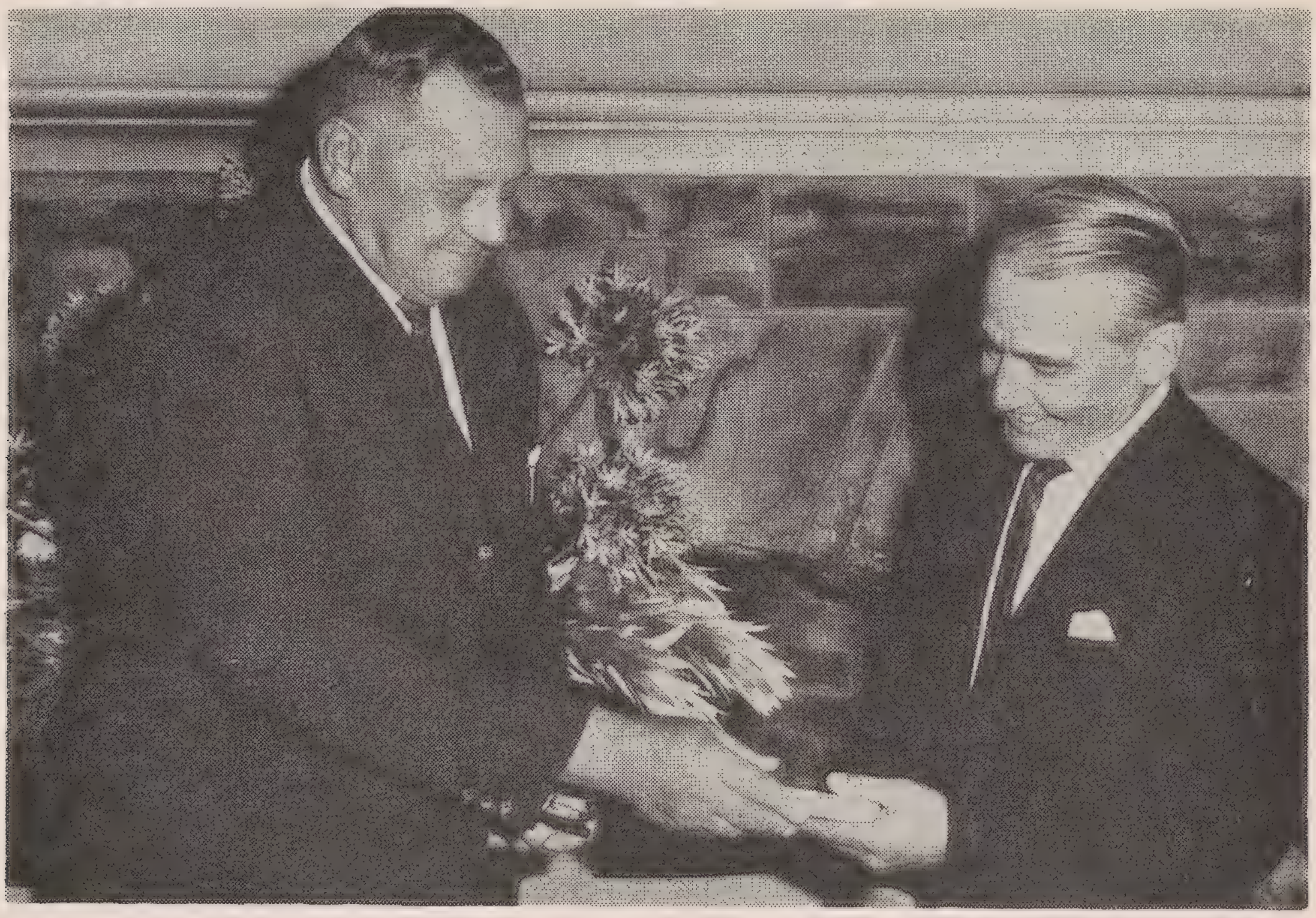

Fig. 13. Mr. Le Roux presenting the 1966 William Herbert Medal to Mr. Leon Boshoff Mostert on behalf of the American Plant Life Society, Feb. 3, 1966. Photo Cape Times.

AMARYLLIS JUDGES CERTIFICATES

Since the last report in the 1966 Amaryllis Year Book (pages 39 and 40), the following numbered Amaryllis Judges Certificates have been issued by the American Amaryllis Society:

155. Mrs. H. Ward Blair, 5405 Cornish, Houston, Tex. 77007 (Horticulture only)
156. Mrs. R. C. Wille, 102 Cherrywood, Bellaire, Tex. 77401 (Horticulture and Arrangements)
157. Mrs. R. H. Haase, 2510 Watertown Mall, Houston, Tex. 77027 (Horticulture and Arrangements)
158. Mrs. Glen Melton, 1225 Archley Drive, Houston, Tex. 77055 (Horticulture only)

159. Mrs. C. L. Mercer, P. O. Box 56, Westfield, Tex. (Horticulture only)
160. Mrs. John Ellett, 7531 Satsuma, Houston, Tex. 77025 (Horticulture only)
161. Mrs. A. G. Horsfall, 110 Clifton, Houston, Tex. 77011 (Horticulture only)
162. Mrs. G. B. Slover, 3006 Castlewood, Houston, Tex. 77025 (Horticulture only)
163. Mrs. Samuel F. Johnson, 39 West Rivercrest Drive, Houston, Tex. 77042 (Horticulture only)
164. Mrs. Clyde Duplissey, 15105 Lakeview, Houston, Tex. 77040 (Horticulture only)
165. Mrs. R. F. Cox, Rt. 3, 1431 Sweet Gum, Humble, Tex. (Horticulture only)
166. Mrs. B. Carrel Tharp, 8218 Mallie Court, Houston, Tex. 77055 (Horticulture only)

PLANT LIFE LIBRARY—continued from page 4.

FLOWERS NATIVE TO THE DEEP SOUTH, by Caroline Dorman. Claitor's Book Store, 241 North St., P. O. Box 239, Baton Rouge, La. 70821. 2nd. ed. 1959. Pp. 176. Illus. $7.50: In this attractive book, including 33 color plates, and 102 text figures, Dr. Dorman has captured the delicacy and charm of native flowering plants of the Deep South. The text is clearly written for both the gardener and scientist. The illustrations by the author alone are worth much more than the price of the book, and it is most highly recommended to all gardeners.

NATIVES PREFERRED, by Caroline Dorman. Claitor's Book Store, 241 North St., P. O. Box 239, Baton Rouge, La. 70821. 1965. Pp. 217. Illus. $5.00. In this companion to her earlier book, Dr. Dorman explores the use of native trees and other plants "for every location". The subject matter includes rock gardens, bulb culture, the shady trail, herbaceous perennials, flowering trees, and shrubs, evergreens, vines, ground covers, pond culture, wild *Iris,* and growing wild flowers from seeds. Again, the fine text illustrations are by Dr. Dorman. Highly recommended to all gardeners.

A MONOGRAPH OF LEMNACEAE, by Edwin H. Daubs. University of Illinois Press, Urbana, Ill. 1965. Pp. 118. Illus. Cloth $4.50; paper, $3.50. This comprehensive monograph on the *Lemnaceae,* the first since the one by Hegelmaier (1868; 1896), will be welcomed by all plant scientists. After considering the fossil record and chromosomes numbers, the lineagic treatment covers in detail the 28 species which are grouped under four genera. The keys, comparative tables of species for the four genera; the 21 plates, and bibliography, greatly enhance the value of the work. Highly recommended to all biologists.

BIBLIOGRAPHY OF MEXICAN FERNS, by George N. Jones. University of Illinois Press, Urbana, Ill. 1966. Pp. 297. $5.00. This bibliography of the principal literature to Mexican ferns will be welcomed by plant scientists. After listing the abbreviations of periodicals cited, the main part of the book is devoted to authors and titles to the published work. Then follow various finding indices, and geographical and systematic indices. A supplement, and indices of plant names and personal names, completes the work. Highly recommended to all plant scientists.

JAPANESE GARDEN AND FLORAL ART, by Mrs. Paul Kincaid. Hearthside Press, 381 Park Ave., S., New York, N. Y. 10016. 1966. Pp. 189. Illus. $6.95. This new book provides an introduction to Japanese aesthetics, flowers, gardens, Zeb and Tea Cult houses, bonkei, bonseki, bonsai, and ikebana. This attractive book is adequately illustrated and is highly recommended.

ADVANCES IN MORPHOGENESIS, VOL. 5. Edited by M. Abercrombie and Jean Brachet. Academic Press, 111 Fifth Av., New York, N. Y. 10003. 1966. Pp. 340.

$14.00. In this 5th Volume of the series, with contributions from six outstanding authorities, the subjects covered include feathers and patterns; the initiation of organized development in plants; the stimulus to hypertrophic growth; the ultrastructure of the cytoplasm of the developing amphibian egg; embryonic determination of neural connections; and the vitelline membrane and cortical particles in Sea Urchin eggs and their function in maturation and fertilization. Recommended to all biologists.

FUNDAMENTALS OF PHYTOMORPHOLOGY, by A. D. J. Meeuse. Ronald Press Co., 15 E. 26th St., New York 10, N. Y. 1966. Pp. 231. Illus. $10.00. In this outstanding new book, Prof Meeuse presents a new outlook on the subject of plant morphology. He contrasts the old static morphology with a new evolutionary concept. Thus, for instance, he explores phylogeny with respect to the gymnosperms and angiosperms; and again, he discusses the phylogeny of the megasporangium with respect to the ovule and the carpellate pistil. This new approach promises to solve various difficult problems in phytomorphology. Prof. Meeuse is to be congratulated on a stimulating book—a land mark—and it is required reading for all plant scientists, students and professionals alike.

BOTANICAL LATIN, by Wm. Stearn. Hafner Publ. Co., 31 E. 10th St., New York 3, N. Y. 1966. Pp. 566. Illus. $16.75. This represents the first complete guide and handbook to botanical Latin, an international technical language developed over the years for the naming and description of plants. The four parts of the book include an introductory section devoted mainly to the development of botanical Latin terminology, and the Latin alphabet and pronunciation; Latin grammar, syntax and other matters; and vocabulary and bibliography. Dr. Stearn is to be congratulated on an important contribution; a book which should be included in the library of all plant biologists.

JOHN TORREY, by Andrew D. Rogers III. Hafner Publ. Co., 31 E. 10th St., New York 3, N. Y. 1965. Pp. 352. Illus. $7.50. This stimulating biography of John Torrey will be welcomed by all plant biologists. He was the mentor of the prominent North American plant lineagicists of his day, including Asa Gray. His activities represent the true beginning of plant lineagics in North America. He received and interpreted the plant materials gathered by the great expeditions of his time. His crowning achievement, in cooperation with Asa Gray, was the production of the first comprehensive North American work in plant lineagics. This is required reading for all plant biologists.

THE LIVING CYCADS, by C. J. Chamberlain. Hafner Publ. Co., 31 E. 10th St., New York 3, N. Y. Facsimile reprint edition 1965. Pp. 172. Illus. $4.00. The classic 1919 original edition of Chamberlain's "The Living Cycads" has been long out of print, and it is a notable event when this was reprinted in 1965. In Part I, Chamberlain discusses the living western, Australian and African cycads; in Part II, he details the life-history of the cycads, and in part III, he considers the evolution and phylogeny of the cycads. Recommended to all plant biologists.

A MYCOLOGICAL ENGLISH-LATIN GLOSSARY, by Edith K. Cash. Hafner Publ. Co., 31 E. 10th St., New York 3, N. Y. 1965. Pp. 152. $8.50. This is Mycological Memoir No. 1, sponsored by the New York Botanical Garden and the Mycological Society of America. The extensive English-Latin glossary of mycological terms will be welcomed by mycologists as well as plant biologists in general.

PRINCIPLES OF ANGIOSPERM TAXONOMY, by P. H. Davis and V. H. Heywood. D. Van Nostrand Co., 120 Alexander St., Princeton, New Jersey. Revised ed. 1965. Pp. 558. Illus. $15.00. The authors consider lineagics as a science of synthesis, incorporating data from various disciplines such as cytology, genetics, embryology, and phytochemistry. The subject is developed under the subject headings, the roots of taxonomy; systematics after Darwin; units of classification; the concept of characters; taxonomic evidence; field, herbarium and library; presentation of data; modification of the phenotype; variation within populations; populations and the environment; evolution and the species; and hybridization and taxonomy. This stimulating book belongs in every lineagic library for constant reference.

PLANT LIFE LIBRARY—-continued on page 95.

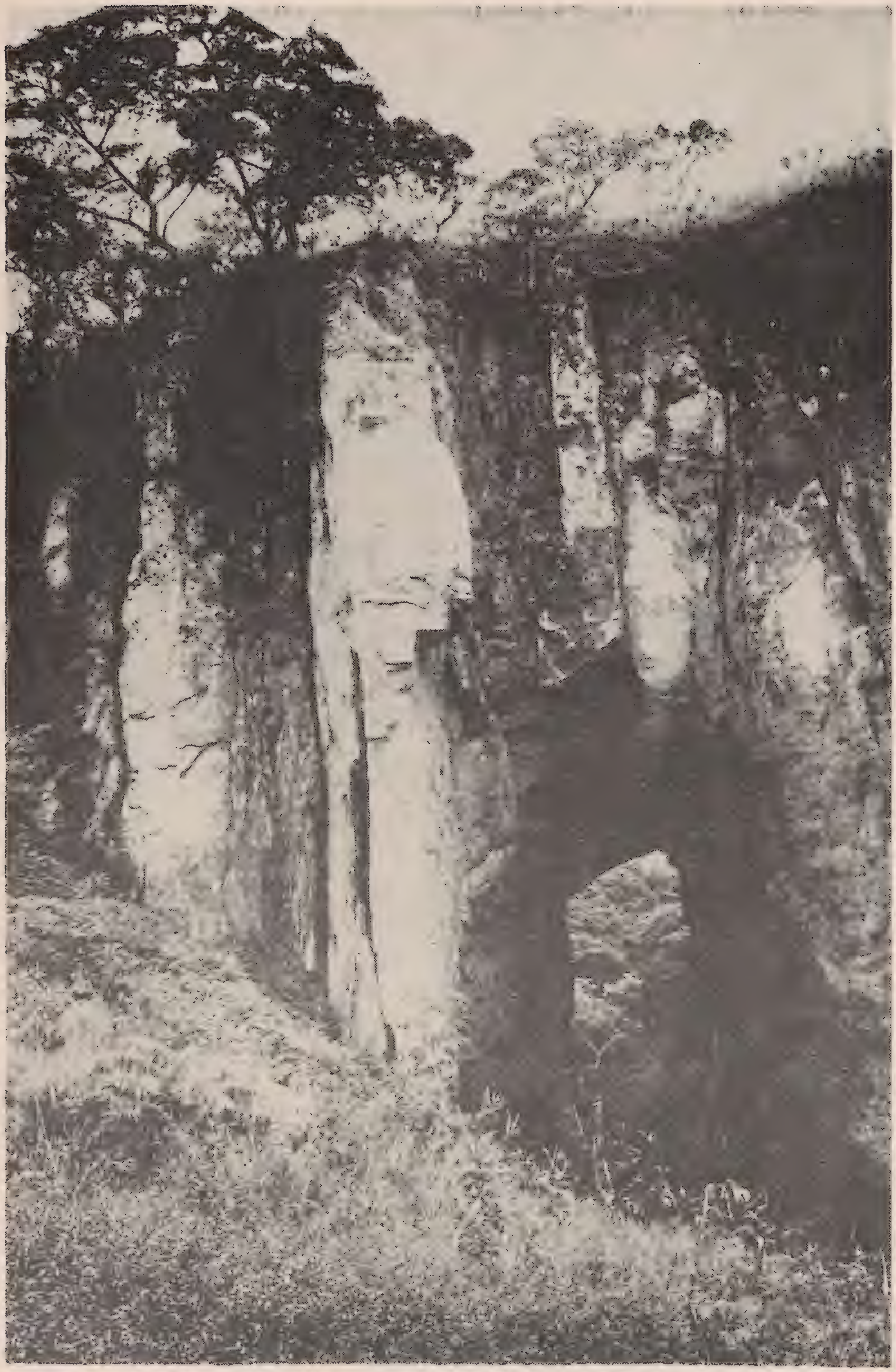

Fig. 14. Natural Arch at San Miserato Hill above Santiago de Chiquitos, Bolivia, the type locality of **Amaryllis starkii** Nelson & Traub. Photo by Martin Cardenas.

2. LINEAGICS

[BIOEVOLUTION, DESCRIPTION, DETERMINING RELATIONSHIPS, GROUPING INTO LINEAGES]

BOLIVIAN SPECIES OF AMARYLLIS L.

Martin Cardenas, *Bolivia*

Most of the known species of Amaryllis in the Andes thrive in humid shady locations. However the Bolivian species are found under rather variable ecological conditions. Most of them are found of course in the ecological formation called ''Yungas'' or the areas on the eastern slopes of the Andes covered by very humid forests ranging from about 1,200 to 1,800 m. to sea level. This formation is characterized by the predominance of tree ferns, *Ericaceae, Begoniaceae, Melastomataceae,* fuchsias, tall grasses and so on. Here belong the short tepaltubed, handsome flowered species, *Amaryllis pseudopardina* Card., (= *A. leopoldii* T. Moore), shown in Fig. 16; *Amaryllis yungacensis* Card. & Nelson, *Amaryllis forgetii* (Worsley) Traub & Uphof and *Amaryllis pardina* Hook. f. In this same ecological formation, grow in a semicultivated status, *Amaryllis vittata* var. *tweediana* and *Amaryllis belladonna* L. In a similar habitat but in a more open though still shaded places appear under bushes the most handsome bolivian Amaryllid, *Amaryllis Mandonii* (Baker) Traub & Uphof, near the village of Sorata at about 2,700 m. (see Fig. 15). The only two white and long-tepaltubed species growing in the Southern ''Yungas'' of Bolivia, are *Amaryllis fragrantisima* Card. (see added note, below); and *Amaryllis chionedyantha* Card. The very rare short-flowered species with a locality known by us only at second hand—*Amaryllis incachacana,* comes also from an upper ''Yungas'' habitat in the center of Bolivia.

Amaryllis reginae L. appears in semi-cultivated habitats, or under cultivation in the borders of the forests where probably there were settlers before the highways were built, on the ''Yungas'' formation at Yungas de Corani, and the present section of the highway near El Palmar at an elevation of 700 m. The plants seen by the late Prof. Nelson were under cultivation at Comarapa.

The second ecological habitat for the Bolivian Amaryllis is the mesothermic interandine high valleys at the center of the country ranging between the Departments of Cochabamba and Potosi from 2,000 to 3,000 m. high. Here are found the small flowered *Amaryllis mollevillquensis* Card., the scented white-flowered *Amaryllis umabisana* Card. and the most odd flowered species *Amaryllis cybister* (Herb.) Traub & Uphof. The two former taxa occur in a true xerophytic habitat under thorny bushes. The third one is strikingly ubiquitous since it appears at Comarapa east of Cochabamba at only 2,000 m. high, then at various localities near Cochabamba at about 2,500 m. and finally down at La Paz in the Hill Muela del Diable, over 3,600 m. Yet, *Amaryllis cybister* (Herb.) Traub & Uphof thrives in clayish hard soil, among rocks or in loose rich soil with flowers which might be red-greenish or yellow-greenish (Fig. 17).

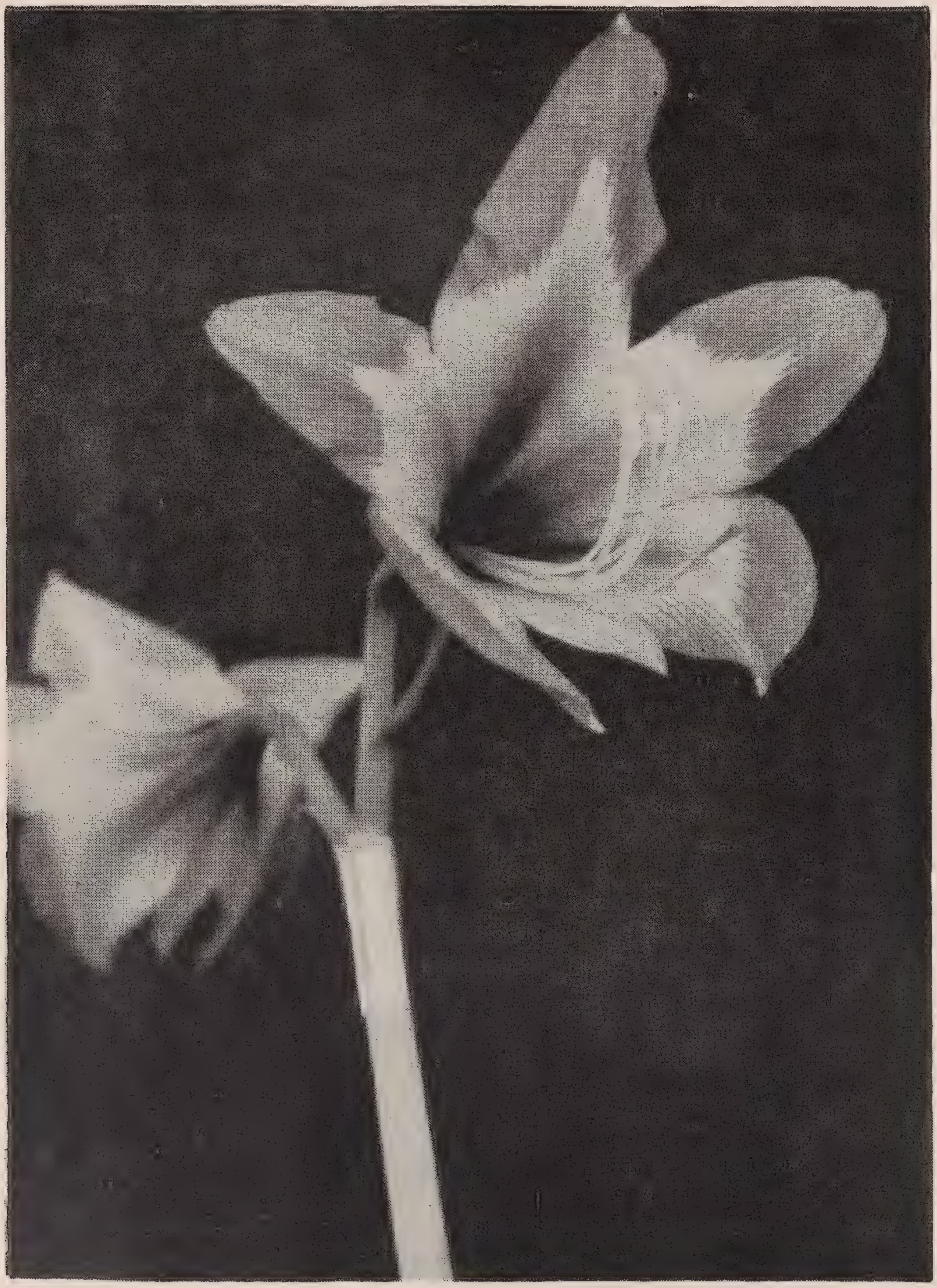

Fig. 15. **Amaryllis mandonii** (Bak.) Traub & Uphof. This represents the first published illustration of this species. Photo by Martin Cardenas.

The beautiful *Amaryllis evansiae* Traub & Nelson grows wild into the low, rather dry forests covering the low eastern foothills of the Andes, near the City of Santa Cruz.

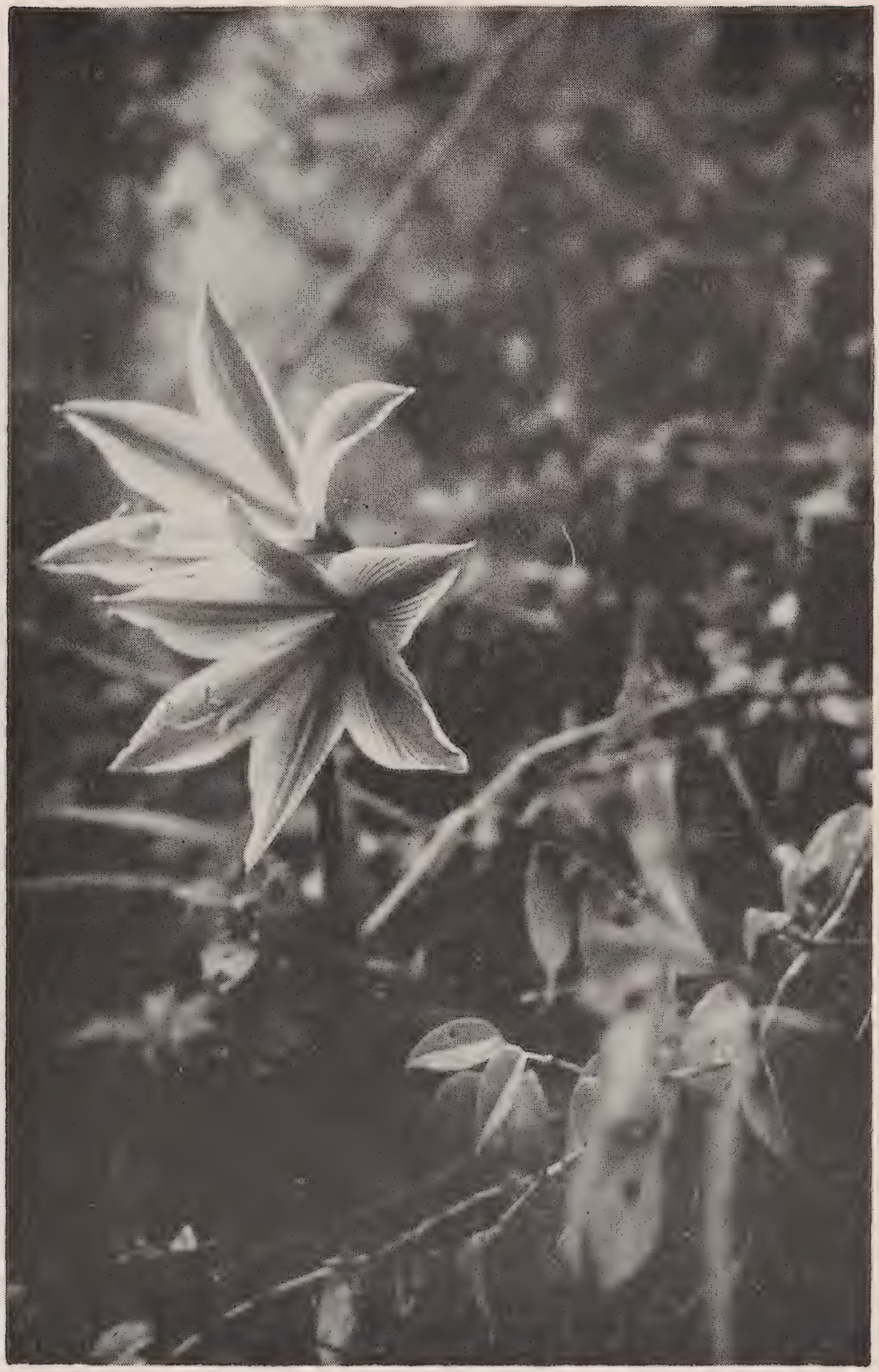

Fig. 16. **Amaryllis pseudopardina** Cardenas (=**Amaryllis leopoldii** T. Moore), as it grows in its native habitat. Photo by Martin Cardenas.

A third habitat for *Amaryllis* in this country is centered in the low grassy lands of Mojos in the North and the Eastern savanna formations. At the Pampas de Mojos from outskirts of Reyes to the vicinity of Lake Rogoagua, grow one long-tepaltubed, white-flower species which was erroneously determined by Dr. H. H. Rusby as *Hippeastrum viridiflorus* Rusby. In our opinion this should be a new species. At the eastern savannas of the Provinces of Nuflo de Chavez, Velasco, Chiquitos and Chaco grow among grasses *Amaryllis divifrancisci* Card., and an undetermined variety of *Amaryllis belladonna* L. In the "pajonales" of southeastern Chaco are found *Amaryllis aglaiae* Castellanos and *Amaryllis parodii* (Hunz. & Coccu.) Traub. Dr. Th. Herzog has collected in the Bolivian Chaco two species which might be referred to *A. aglaiae* Castellanos and *A. parodi* although they were identified in 1910 as "*Hippeastrum brachyandrum* Baker" and "*H. solandriflorum* Herb." by Kranzlin. Among the very old sandstone rocks and growing in a rather loose soil, Prof. Nelson discovered the rare species *Amaryllis starkii* Nelson & Traub in the Province of Chiquitos (see Fig. 14).

A fourth habitat for our *Amaryllis* species, is in the upper Amazon basin areas. Here and still on the slopes of the Andean Mountains, appear *Amaryllis viridiflora* (Rusby) Traub & Uphof, *Amaryllis pardina* Hook, f., *Amaryllis belladonna* L. and *Amaryllis crociflora* (Rusby) Traub & Uphof. The species *Amaryllis pardina* Hook. f. which occurs in this area and about Apolo, Department of La Paz, seems to us the true species brought up to England by Pearce since the other type found in Yungas of La Paz, has on its tepalsegs blood red streaks instead of red dots. The type of *Amaryllis crociflora* (Rusby) Traub & Uphof which we have seen last year at the N. Y. Botanical Garden Herbarium is closely similar to *A. belladonna* L. whilst the one specimen we have collected at the type locality (Rio Guarutumo) in 1959 and given to the late Prof. Nelson, is different though we took it in 1960 before having seen the type, as *A. crociflora* (Rusby) Traub & Uphof. From the Bopi River regions and from Tipuani Mountains come various specimens collected years ago by B. A. Krukoff and G. H. Tate, actually at the N. Y. Botanical Garden Herbarium, determined as *Hippeastrum puniceum* Urb. or *H. Mandonii* Baker by E. J. A. and H. Rusby which however seem to us as new Amaryllis species. From the upper Rio Beni (Amazon Basin) was collected by M. A. Garriker Jr. what is now *Amaryllis belladonna* var. *Haywardii* (Traub & Uphof) Traub & Moldenke.

The Amaryllis species which grow in Yungas of La Paz, bear thick and succulent roots which might remain alive for several days. The bulbs of these are thriving on rather superficial very thin soil covering rocks. The species belonging to the mesothermic central valleys have medium thick roots and bulbs are entirely below the surface, and sometimes are deeply buried in a clayish soil. The roots of these bulbs may dry out in a few days. The thinnest roots are found in *A. starkii* Nelson & Traub since this grows in a loose quite pure sandy soil and consequently they dry out quite soon.

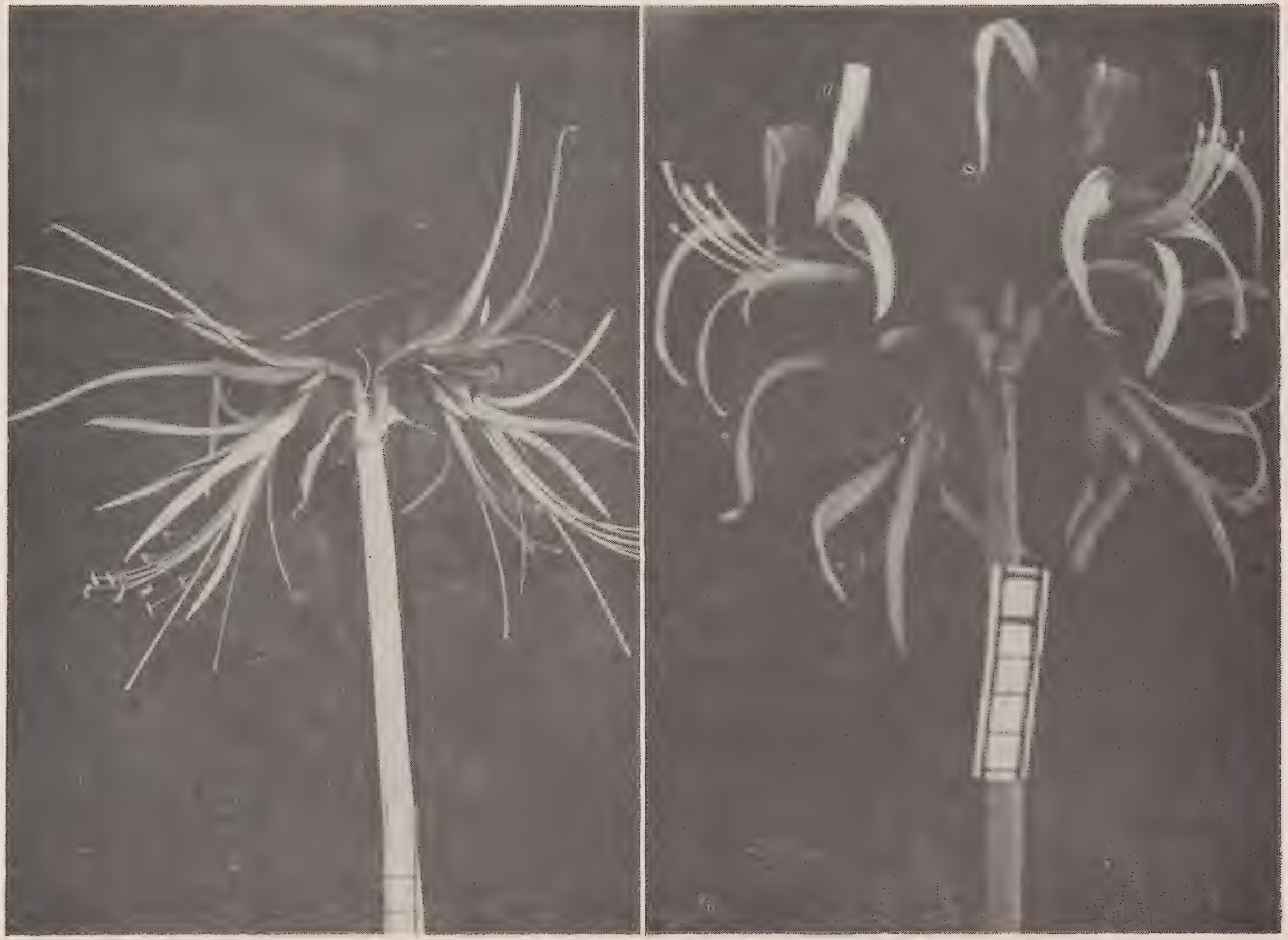

Fig. 17. **Amaryllis cybister** (Herb.) Traub & Uphof, **left**, the form with narrow tepalsegs which led Rusby to the erroneous conclusion that it was new, and the type of his "Lepidopharynx deflexa". **Right**, the form with wider tepalsegs. Photos by Martin Cardenas.

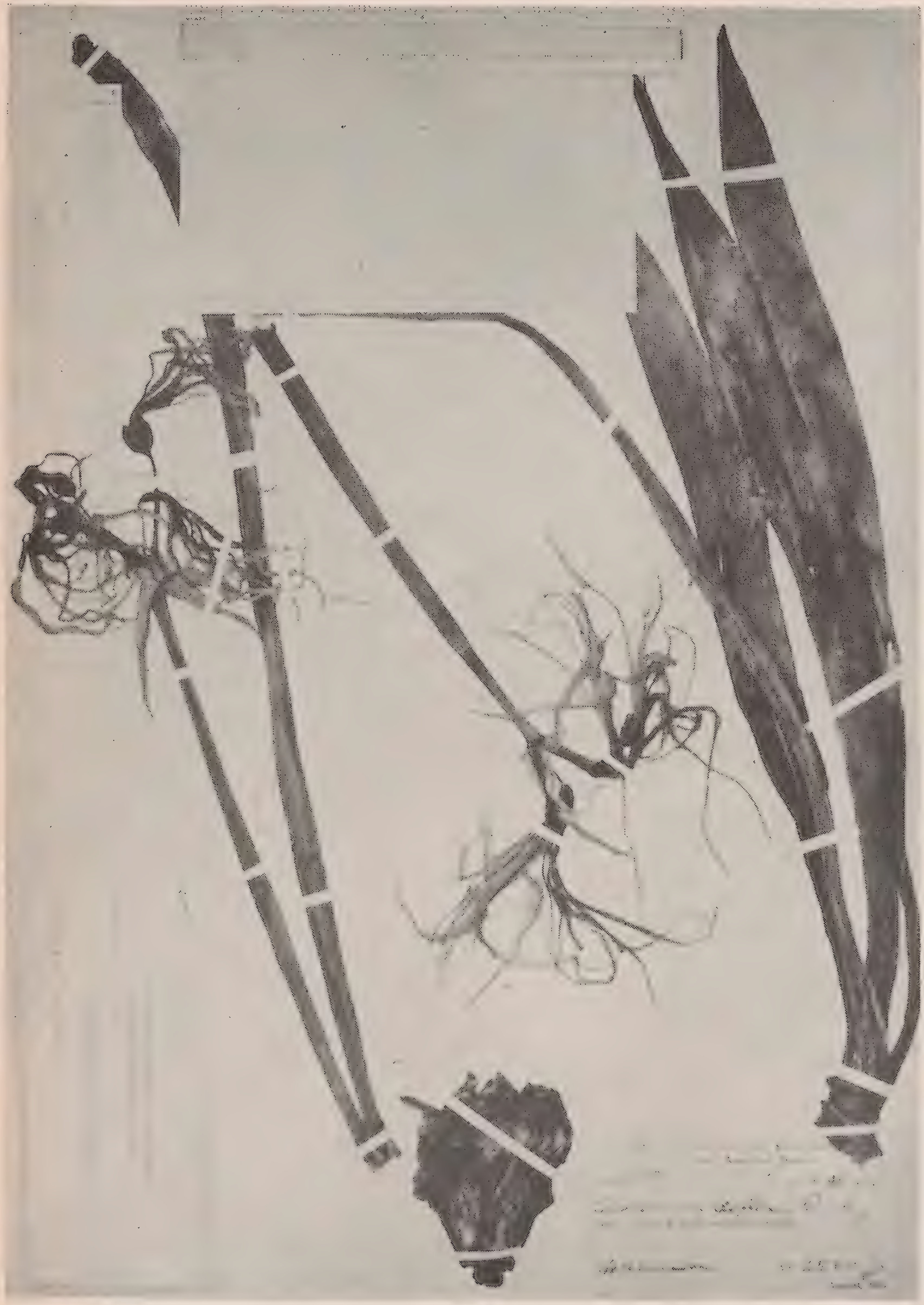

Fig. 18. The "type specimen" of the superfluous "Lepidopharynx deflexa Rusby". See also Fig. 16 for the form of **Amaryllis cybister** with narrow tepalsegs. Photo New York Botanical Garden.

We assume that in Bolivia one might expect *Amaryllis* species almost everywhere and that there still may be many yet to be discovered.

ADDED NOTE: THE TRUE LOCALITY FOR AMARYLLIS FRAGRANTISSIMA CARD.

In the 1960 Amaryllis Year Book, I described the species *Amaryllis fragrantissima* Card., based on a cultivated plant given me by a student of Agronomy as coming from Yungas de Corani, Province of Chapare, Dept. of Cochabamba. About March of this year (1966), my former assistant, Miss Ana M. Krueger while collecting plants for me near Tablas, happened to find several *Amaryllis* plants without flowers. The bulbs she brought back were planted here at the University, and one bulb is now in flower (October), and it is *Amaryllis fragrantissima* Card. It is native near the Village of Tablas at about 1,800 m. The locality given with the original description was Yungas de Corani, and Yungas de Tablas is next to this locality, and both are in the Province of Chapare. Like other *Amaryllis* species, this one is dichogamous with the anthers dehiscing pollen before the stigma becomes receptive. This insures that some of the progeny are cross-pollinated.

"GENUS LEPIDOPHARYNX" REDUCED TO SYNONYMY

MARTIN CARDENAS, *Bolivia*

The Genus *Lepidopharynx* in the Family Amaryllidaceae was proposed by the late Prof. Dr. Henry Hurd Rusby, Dean of the School of Pharmacy, Columbia University, and published in Memoirs of the New York Botanical Garden 7:205-387, 1 Mr 1927. Since that date the species *Lepidopharynx deflexa,* the only one included in that genus, was not collected again until November 1958 when Prof. Ira S. Nelson and myself collected it at the type locality (Fig. 17). These bulbs which turned up to be *Amaryllis cybister* (Herb.) Traub & Uphof. In 1965 at the beginning of September, I examined the type specimen of the *Lepidopharynx deflexa* Rusby at the New York Botanical Garden Herbarium and verified that it was *A. cybister* (Herb.) Traub & Uphof. The drawing illustrating the proposed genus *Lepidopharynx* does not agree well with the dry specimen in the details of the tepalseg habit. I am familiar with several forms of the very variable *A. cybister* and I am convinced that *Lepidopharynx deflexa* Rusby does not represent a valid taxon. Consequently the Genus *Lepidopharynx* must be reduced to the synonymy of *Amaryllis L.* Traub, in "The Genera of Amaryllidaceae" (1963) page 77 had indicated that the genus *Lepidopharynx* might have to be erased, and Traub (Plant Life 1966, p. 5) reduced the genus to the synonymy of *Amaryllis L.,* and the species to *A. cybister* (Herb.) Traub & Uphof. The type specimen of *Lepidopharynx* is shown in Fig. 18.

Universidad San Simon
de Cochabamba, Bolivia
June 20, 1966

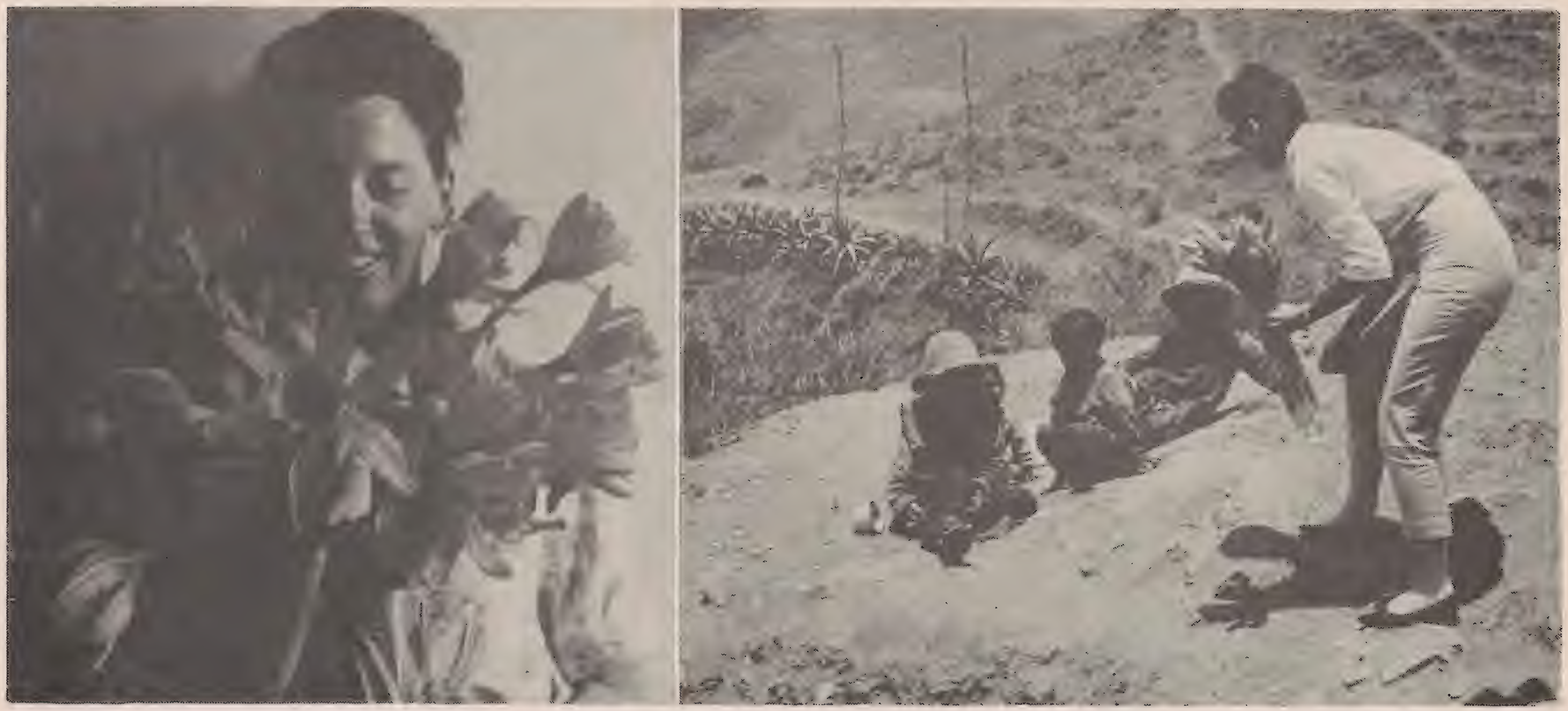

Fig. 19. **Left,** Mrs. R. J. Seibert holding a bouquet of **Paramongaia weberbaueri** Velarde ("Cojomaria") flowers. **Right,** Mrs. Seibert purchases "Cojomaria" from Amerindian children, above Pariacoto, Huaraz, Casma Road, Dept. of Ancash, Peru, January 1965. Longwood Gardens. Photo by R. J. Seibert.

"COJOMARIA"—PARAMONGAIA WEBERBAUERI VELARDE, FROM PERU

Russell J. Seibert, *Director,*
Longwood Gardens, Kennett Square, Penna.

To see a fine new ornamental plant is exciting to me. However, to find such a plant in its natural local habitat is a memorable experience and probably explains why, for the past 30 years of my graduate student and professional life, plant exploration has attracted me to other parts of the world. This attraction, like a compatible marriage, does not wane with maturity. It becomes even more magnetic.

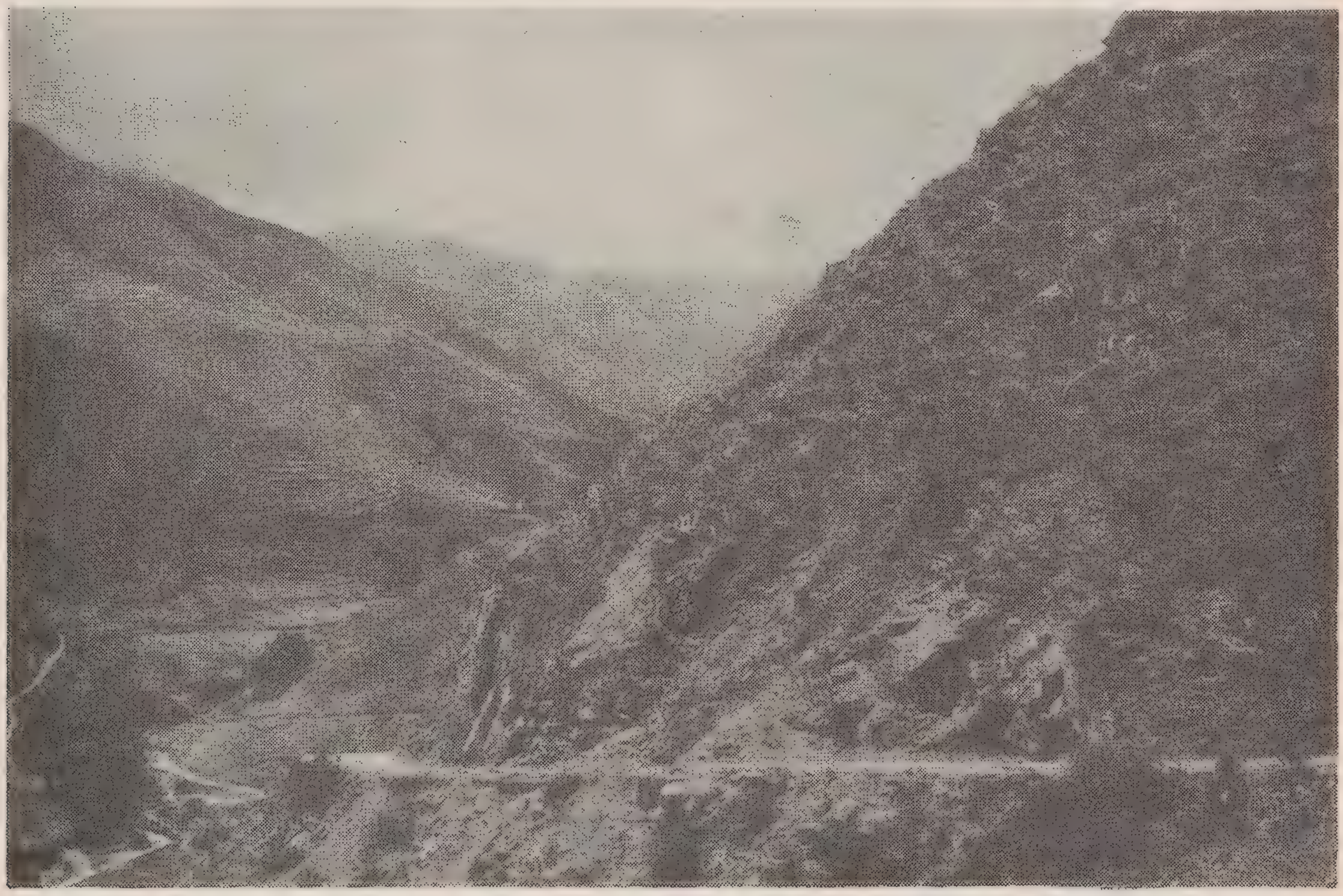

Fig. 20. Habitat of "Cojomaria", **Paramongaia weberbaueri** Velarde, above Pariacoto, Huaraz-Casma Road, Dept. of Ancash, Peru. Longwood Gardens Photo (January 1965) by R. J. Seibert.

While returning from Huaráz and the Callejón de Huaylas to the Coast of Peru via the Huaráz-Casma Road on January 22, 1965, we were attracted by a sizeable bouquet of large yellow flowers being carried by a lone Andean Indian on horseback. The flowers, he said, were called ''Cojomaria'' and were found growing further down the road. A short drive and several high Andean switchbacks down, we encountered three children attending several bouquets of the same large, yellow amaryllidaceous flowers (Fig. 19). Obviously, the bouquets were for sale but since the children spoke no Spanish, our Quetcha proved insufficient to communicate well. We surmised that the plants grew in an area further down the Andean slopes and that for a 5-Sole note, we could purchase a sizeable bundle of flowers. What remarkable blooms! At first sight, they remind one of giant daffodils, some 6 inches in diameter, butter yellow and very fragrant (Fig. 19).

Further down the Andes at somewhat less than 10,000 feet and along the steep slopes immediately above the village of Pariacoto, Department of Ancash (Fig. 20), we suddenly observed huge quantities of the flowering bulbous plants growing within a rather restricted area of perhaps less than 1000 acres. The soil appeared to be a decomposing granite. The natural vegetation was sparse scrub, almost chapparal-like. The plants were growing on extremely steep slopes which made their collection both difficult and precarious. With the aid of a car jack handle and digging to depths of 1 foot, entire plants, including the bulbs, were recovered (Fig. 20). The plants all appeared to bloom before the presence of mature foliage. None of the seven bulbs collected showed any evidence of off-sets. Two flowering bulbs were collected and

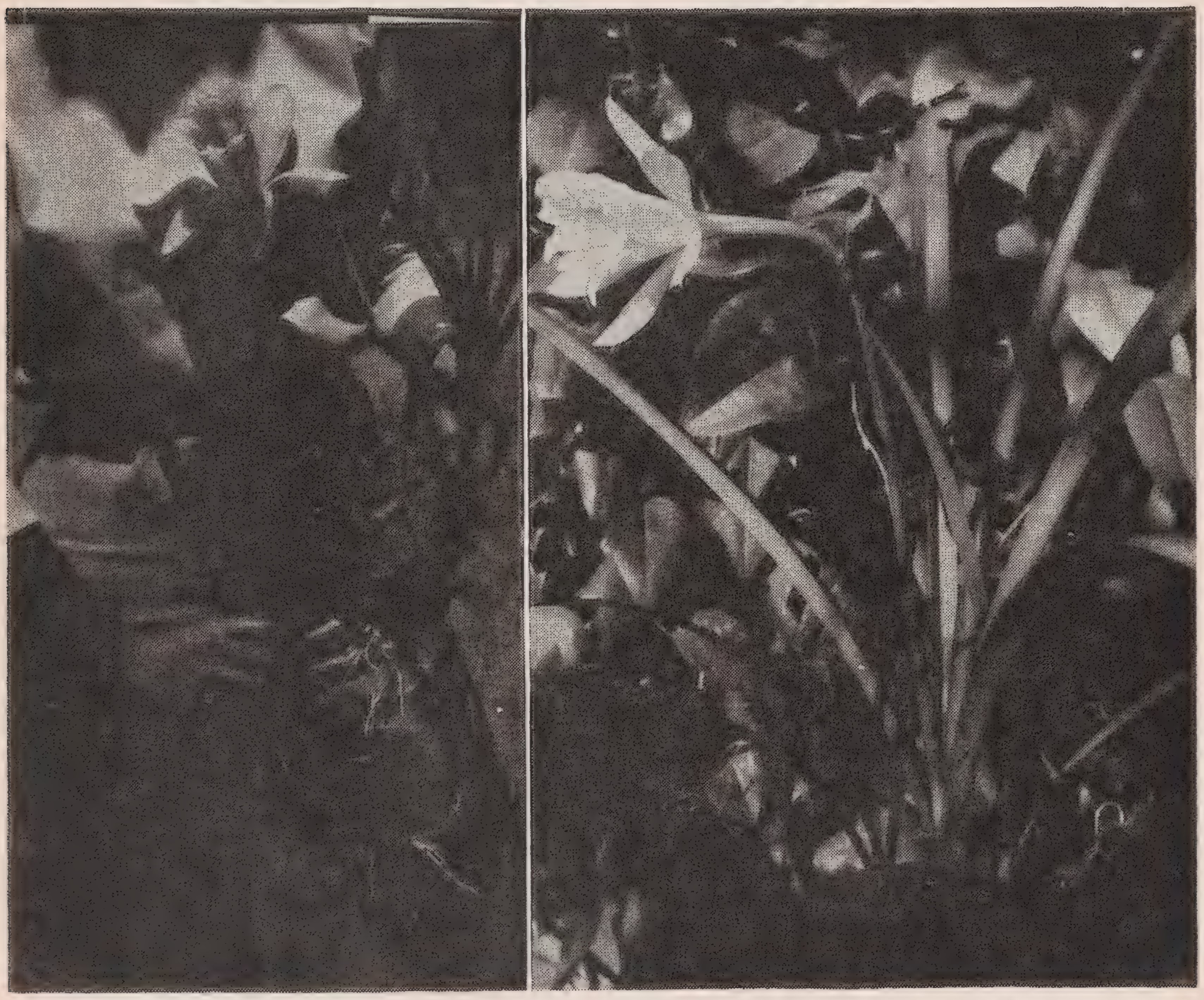

Fig. 21. **Left,** young flowering plant of "Cojomaria", **Paramongaia weberbaueri** Velarde, Pariacoto, Peru. **Right,** cultivated **Paramongaia weberbaueri** Longwood Gardens #572124, Kennett Square, Penna., note offsets (see text). Longwood Gardens photos (January 1965) by R. J. Seibert

these were up to 2½ inches in diameter. Of the 5 younger, pre-flowering bulbs collected, diameters ranged from ¾″ to 1″. The young foliage was exceptionally clean and fresh looking.

These flowers were kept for several days and a few lasted until returning to Lima 4 days later, at which time, some of the flowers and one of the flowering sized bulbs were presented to Dr. Ramon Ferreyra, Director, Muséo de Históŗial Naturál ''Javier Prado''. It was not, however, until sometime later while discussing the plant with Dr. Jorge Leon, A.I.D. Botanist in Lima, that its identification was determined. The plant apparently is not well known outside its natural habitats of the Department of Ancash. According to Dr. Leon, it has been tried in Lima on at least one occasion, but with little success as a garden plant.

Six bulbs of flowering size were shipped to the Plant Inspection House in Miami, Florida, and in turn forwarded to the USDA Plant Introduction Station at Coconut Grove for continuing the growth cycle. When established, 5 pre-flowering size plants were forwarded to Longwood Gardens in mid-April 1965, where they are accessioned under our number 65522. The plants were dried off from May to August. In December, they renewed their growth withont flowering.

Another accession of *Paramongaia weberbaueri*, Longwood Gardens #572124 (Traub #T-248) consists of four plants resulting from seeds distributed to us by Dr. Hamilton Traub in 1957. Two of the four plants produced their first flower this year, one from January 17-28; the other, February 7-15, 1966 (Fig. 21). Their origin, according to correspondence from Dr. Traub, traces to ''Bulbs from Department of Ancash, Lomas de Lupin, between Huarmey and Barranca, 225 km, north of Lima, on the Pan American Highway, along the Coast.'' Possibly because of their first flowering, the flowers of both these plants average only slightly more than half the size of the flowers observed on the plants collected in the indigenous Pariacoto habitat. Young offsets are forming on each bulb of the Traub accession. None, however, were noted on the wild plants near Pariacoto. It will now be interesting to observe these two accessions growing together for future comparisons between plants of coastal origin and those of mountain origin.

NERINE NEWS NOTES

EMMA D. MENNINGER

The Nerine Society has recently been organized in England "with hopes that it will be truly international." An attractive folder has been sent to me with a beautiful black and white photograph of Nerine 'Inchmery Kate' on the cover. The objects of the society as stated are:

1. To make the genus more widely known.
2. To discover and make known the best cultural techniques.
3. To establish a Register of names and descriptions in accordance with the International rules of nomenclature.
4. To encourage the improvement of the forms in cultivation.
5. To provide facilities for Members to exchange ideas, information and material. "It is proposed to publish a regular bulletin." The subscription is $2.00. Further information can be had from the secretary, Mr. C. A. Norris, Clent House, Clent, Worcestershire, England.

Mr. J. T. Gallagher, who contributed to Plant Life 1966, has a comprehensive paper on "Greenhouse Nerines" in the journal of the Royal Horticultural Society for May 1966. Besides describing the culture of Nerines in England, the article is enhansed by a page of Mr. Gallagher's beautiful colored photographs of the following clones: 'Mariloo' AM, RHS, 'Nena', 'Tancred', 'Eddy', 'Bagdad' and 'Highdown Orange'.

The June issue of the Journal of the Royal Horticultural Society has an article "Greenhouse Nerine Cultivation" by Mr. C. A. Norris, the Secretary of the new Nerine Society.

In last year's Plant Life, I wrote of my interest in pure white Nerines. From Mr. Gallagher, I learned of the giant snow white 'Vestal' at Exbury. I have been promised a bulb of this clone next year. Further reporting on my 24 seedlings from my white clone 'Crystal Palace' ♀ with pollen from other pure whites, there are as of the 1965 season: 5 unflowered, 4 pure white which I named 'Glacier', 'White Swan', 'Taj Mahal' and 'Cumulus'. The other 8 clones were tints of pink. Of the five unflowered clones, I hope to have at least one more pure white. One of the two seedlings from 'Star White' mentioned last year produced a white with some pink only in the bud—its name 'Carrara,'

A South African enthusiast of Nerines is Mr. Ken Douglas, Kingswood College, Grahamstown. He is preparing a monograph on Nerines. He has a comprehensive collection of Nerine species including a white variety of *N. undulata.* Being in the vicinity of the habitats of the various species of Nerines, Mr. Douglas' monograph should give much information on the ecological demands of these species including the many rare ones.

Mrs. Sima Eliovson of Johannesburg gave a fine illustrated lecture at the Los Angeles State and County Arboretum in Arcadia recently on the flora of South Africa. I asked her about the pure white *N. sarniensis* from Table Mountain. She replied that it is very scarce and is not available in South Africa, but I might get it from England!

The tempo of *Nerine* interest has certainly increased this year and these beautiful flowers are getting the publicity they have so long deserved.

Greenoaks,
700 North Old Ranch Road,
Arcadia, California, 91006

NEW EUSTEPHIA SPECIES

CESAR VARGAS, *Cuzco, Peru*

Until recently, only three species of *Eustephia* Cav. had been described. In 1954 and again in 1960, the present writer proposed new species, and also a variety of the original species was described in 1944.

(1) *Eustephia coccinea* Cav. (1790)
  var. *coccinea*
  var. *multiflora* Vargas (1944)
(2) *Eustephia pamiana* Stapf (1929)
(3) *Eustephia armifera* Macbride (1951)
(4) *Eustephia longibracetata* Vargas (1954)
(5) *Eustephia darwinii* Vargas (1960)

Eustephia var *coccinea* is widely distributed in Peru, and grows at altitudes of 3000 to 3600 m., but the variety *multiflora* is known up to the present only from one locality around the town of Lares, Calca, Cuzco, alt. 3200 m. The Latin and Spanish descriptions may be read in ''De Nobis Especiebus Florae Peruvianae'', in Bo. Hist. Nat. ''Javier Prado'', vol. VIII, nr. 30-31, page 215. 1944, Lima, Peru; holotype CVC 3586. The English description follows:

The *bulbs* of the variety are larger than those of the original species, and there is a well-developed *bulb-neck*, the *plant* is more robust, including the *scape*, which is longer and thicker, purple, and angular; the *spathe-valves* are purple, and longer and wider; the *umbel* is about 8—10-flowered; the *pedicels* are 6.5 cm. long; the *perigone* is shorter, purple; the *setepalsegs* are provided with a longer claw at the apex, and the *teeth* on the *stamen-filaments* are shorter and wider.

Eustephia longibracteata Vargas (1954), in Rev. Univ. Cuzo, nr. 107, 2nd semester, page 152, fig. 1. 1954. This species is endemic to the Ollochea Valley, Puno, Peru, and it is closely related to *Eustephia armifera* Macbride (1951), but differs in the following characters: *Bulbs* oblong, robust, *bulb-neck* long, 12—15 cm. long; the *scape* is robust, angular, 26 cm. long, and 10 mm. in diam.; *spathe-valves* are longer than the flowers, purple; *pedicels* 2.6 cm. long (in *E. armifera* they are only 1.5 cm. long), the *tepalsegs* are purple, shorter and wider, the *setepalsegs* shorter; the *stamen-filaments* are wider, and the *teeth* are wider and curved, acute (quite different from those of *E. armifera* Macbride). This description was made from living specimens.

Eustephia darwinii Vargas (Bol. Fac. Cien. Univ. Nac. Cuzco, nr. 1, page 7, fig. 3, 1960). The following description was made from living material which is under cultivation at Cuzco. The *bulb* is oblong, 7 cm. long, 4 cm. in diam., *bulb-neck* 15 cm. long, 2.3 cm. in diam.; *leaves* lorate, 9—12, appearing after the flowers, 123 cm. long, 3 cm. wide; *scape* robust, angular, 45 cm. long, 1.8 cm. in diam., red, *spathe-valves* 6 cm. long, 1.2—1.4 cm. wide at the base, somewhat triangular; *umbel* 5—9-flowered; *pedicels* 3—4.2 cm. long, red; *setepalsegs* red, green tipped, short-spatulate, 4.5—5 cm. long; *petepalsegs* as long as the setepalsegs, but wider, pink, whitish and green and yellow at the apex; *stamens* somewhat exserted; the *stamen-filaments* winged and the teeth 4 mm. long; *stigma* slightly lobulate. This species is quite different from the others.

REPORT ON "EUSTEPHIA JUJUYENSIS"

HAMILTON P. TRAUB

For a number of years attempts have been made to trace down the name, "Eustephia jujuyensis", given to a plant collected by Harry Blossfeld of Sao Paula, Brasil. Under date of November 16, 1965, Mr. Blossfeld reported:

"The only thing I can inform you about "Eustephia jujuyensis" is that I gathered a number of samples in 1935 in northern Argentina and sent live material of all of these to Messrs. Van Tubergen of Haarlem, Holland; botanical samples also were sent to the Dahlem Botanical Garden, where I was a student at the time. Among this material was *Amaryllis immaculata* and "Eustephia jujuyensis." The species name of the latter points to its origin, the Province of Jujuy, where I gathered both of the above mentioned plants. I do not remember, nor can I now trace who gave me these identifications, Dahlem or Van Tubergen. The herbarium specimens I obtained then—about 1,000 sheets of dried plants from Argentina—the whole lot was lost when our truck stuck in the water of the Rio Branco near Salta; the lighter weight part of our luggage was immediately swept away by the current."

The writer has a bulb of what is reported to be "Eustephia jujuyensis" growing in his garden, and hopes to report a detailed description in PLANT LIFE when it flowers. Two other species of *Eustephia, E. coccinea Cav.*, and *E. darwinii* Vargas, thrive in his garden, blooming two or three times each year. However, they all set no seeds, and this has retarded the wider distribution of these choice amaryllids. They are especially recommended for outdoor culture in California, and similar climates.

NOTHOSCORDUM FELIPPONEI BEAUV. ITS STATUS AND CHROMOSOMES

Pedro Félix Ravenna

Owing to the fact that the present species has been transferred successively to several genera, it appears desirable to give a description and a brief discussion of its nomenclature. In addition, its chromosomes are here reported for the first time.

STATUS OF NOTHOSCORDUM FELIPPONEI

Nothoscordum felipponei Beauverd, Bull. Soc. Bot. Geneve, ser. II, 13 : 267. 1921. *Triteleia sellowiana* Kunth, Enum. Pl. 4 : 466. 1843; *Milla sellowiana* (Kunth) Baker, Journ. Linn. Soc. Bot. 11 : 383. 1871; *Brodiaea sellowiana* (Kunth) Baker, Garden Chron. ser. III. 20 : 459. 1896; *Brodiaea felipponei* (Beauv.) Herter, Flora Urug. 2 : 47. 1930; *Beauverdia felipponei* (Beauv.) Herter, Boissiera 7 : 510. 1943; *Beauverdia sellowiana* (Kunth) Herter, loc. cit.; *Ipheion felipponei* (Beauv.) Traub, Pl. Life. 11 : 128. 1955; *Tristagna felipponei* (Beauv.) Traub, Pl. Life 19 : 61. 1963; *Tristagma sellowianum* (Kunth) Traub, loc. cit.-Excl. syn.: *Nothoscordum ostenii* Beauverd, Boissiera, ser. II, 8 :996, fig. 1-J-M. 1908 (a different species).

Plant 25-80 mm. high. *Bulb* almost ovoid covered with ochraceous coats, with a short neck, about 12-16 mm. long, 10-13 mm. in diam. *Leaves* crowded, spreading, entirely glabrous, often firm in texture, dark green, oblong-lanceolate or linear, canaliculate but not carinate, becoming narrower at the apex, about 3-8 cm. long and 2-7 mm. wide. *Scapes* often several to each bulb, becoming decumbent from their base after flowering, about 2-5 cm. long. *Spathe* bivalved, valves brownish, membranaceous, ovate-lanceolate, about 11-13 mm. long, 3,5-7 mm. in. wide, united at their base for 3,5-4 mm. of their length. *Umbel* 1-flowered, flowers yellow, often very large, about 18-32 mm. in diameter. *Pedicels* about 2.8-6 mm. long. *Tepalsegs* oblanceolate, subequal, united at the base for 1.4 mm, ascending for 4-7 mm., then spreading, about 14-22 mm. long, 5-7 mm wide. often acute, outer tinged with brownish-red in the outside. *Filaments* subequal, erect, somewhat flattened, becoming narrow at the apex, about 5.5-7 mm. long attached at the same level at the base of the tepalsegs. *Anthers* versatile, oblong, yellow, about 2-2.2 mm. long. *Ovary* ovoid or oblong-ovoid, green, about 4.3-5.5 mm. long, 2-2.7 mm. in diam. *Style* elongated nearly 5.5 mm. long or sometimes less; *stigma* capitate, obscurely bilobed or trilobed. Chromosomes $2n=10$.

Exsiccatae.-Uruguay, Montevideo, Cuchilla Pereyra; leg. *F. Felippone* 3493 (isetypus SI). Montevideo; leg. *F. Felippone* 3471 (SI). Without locality; leg. *F. Felippone* 5763 & 6029 (SI). Montevideo, Cerro; leg. *Herter* 434 (80842), apr. 1926 (SI). Brasilia meridionalis; leg. *Sello* s/n (phototypus ex K).

Despite the locality data (probably incorrect) of the Sello's material, this beautiful species seems to be endemic to the rocky hills of central and southern Uruguay. It was originally classified as *Triteleia sellowiana* by Kunth, but this was never recognized as a *Nothoscordum.* In the same work this author gave a description of another species, calling it *Nothoscordum sellowianum* Kunth. Owing to this fact, the name *sellowianum* cannot be used for our plant. Incidentally, Beauverd described *Nothoscordum felipponei* as a new species. Later, after having been transferred by Baker (1871, 1896) to another genus, it was included by Herter (as both *N. felipponei* and *Triteleia sellowiana*) in *Beauverdia.* This genus was untenable because it was a mixture of discordant elements: some of the species belonged to *Nothoscordum* and the rest to *Tristagma.* Lately, *N. felipponei* was transferred by Traub (1959), with the rest of the species of *Beauverdia* to *Ipheion,* and, recently, when the latter was interpreted as a synonym of *Tristagma,* to this genus (1963). Actually Beauverd's interpretation of *Nothoscordum* was correct. With mostly free tepals, filaments subequal and a clearly visible ovary, our species must be considered as a genuine *Nothoscordum.*

In order to assist in distinguishing *Nothoscordum* from *Tristagma,* the following key is presented:

1a. Tepals more or less united in a tube or narrow cup which conceals the ovary. Filaments very dissimilar in length, attached at different levels often inside the tepal tube .... *Tristagma*
1b. Tepals more or less united at the base, often forming a funnel which does not conceal the ovary. Filaments often subequal, attached almost at the same level at the throat of the tepal tube .... *Nothoscordum*

NOTHOSCORDUM SPECIES RESTORED

The following listed taxa, which were included or transferred to *Beauverdia, Ipheion* and *Tristagma,* are *Nothoscordum* species:

Nothoscordum lorentzii (Hert.) comb. nov.—Syn.-*Beauverdia lorentzii* Herter, Boissiera 7:509. 1943; *Ipheion lorentzii* (Hert.) Traub, Pl. Life 5:50. 1949; *Tristagma lorentzii* (Hert.) Traub, Pl. Life 19:61. 1963.

The present, an amazing almost always tetramerous species, I select as the type-species of *Beauverdia* Hert.

Nothoscordum hirtellum (Kunth) Herter, Ind. Sem. Montev. 1928-29.—Syn.-*Triteleia hirtella* Kunth, Enum. Pl. 4:465. 1843; *Milla hirtella* (Kunth), Baker, Journ. Linn. Soc. Bot. 11:385. 1871; *Brodiaea hirtella* (Kunth) Baker, Gard. Chron. ser. III, 20:459. 1896; *Nothoscordum canescens* Beauverd, Bull. Herb. Boiss. ser. II, 8:997, fig. 1-A-D. 1908; *Beauverdia hirtella* (Kunth) Herter, Boissiera 7:509. 1943; *Ipheion hirtellum* (Kunth) Traub, Pl. Life 5:50. 1949; *Tristagma hirtellum* (Kunth) Traub, Pl. Life 19:61. 1963.

Nothoscordum lloydiiflorum Beauverd, Bull. Herb. Boiss. ser. II, 8:998, fig. 2 1908.—Syn.-*Beauverdia lloydiiflora* (Beauv.) Herter, Boissiera 7:510. 1943; *Ipheion lloydiiflorum* (Beauv.) Traub, Pl. Life 5:50. 1949; *Tristagma lloydiiflorum* (Beauv.) Traub, Pl. Life 19:61. 1963.

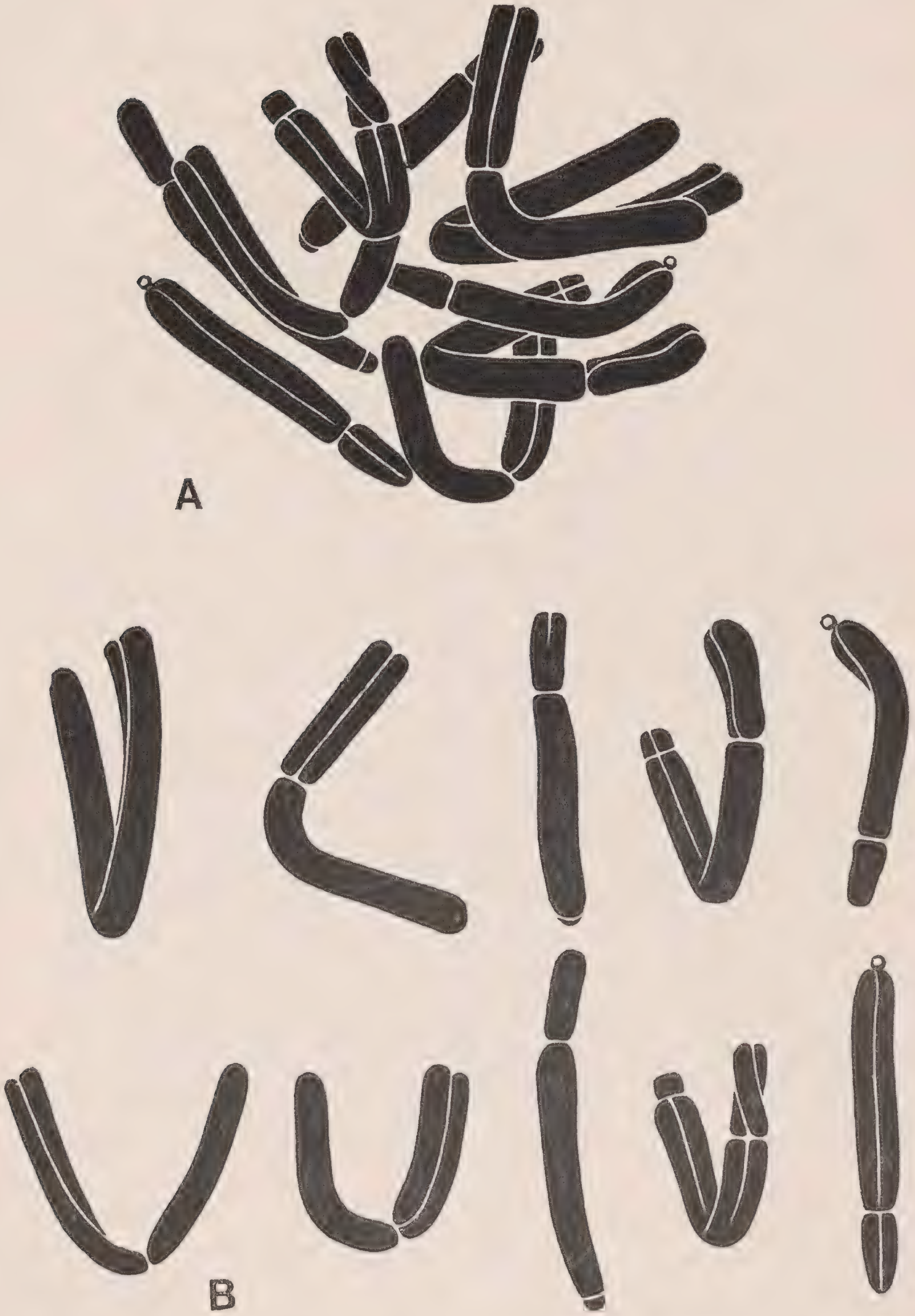

Fig. 22. The chromosomes of **Nothoscordum felipponei** Beauv. Drawing made with a camera-lucida at a table magnification of approx. X2300, and reduced approx. by 22% in reproduction.

CARYOLOGY

This work was carried out in the Genetics II Laboratory, Faculty of Sciences, University of Buenos Aires.

The previously reported chromosome numbers in *Nothoscordum* Kunth, are indicated in Table 1.

Table 1. Chromosome numbers reported in **Nothoscordum** Kunth, up to 1966. x=8, 9 (triploids apomiptic).

Species	2n	Authority
bivalve (as **striatum**)	16	Levan, Hereditas 20: 289. 1935
bivalve	18	Beal, Bot. Gaz. 93: 278. 1932
inodorum (as **fragrans**)	16, 24/3	Messeri, Nuovo G. bot. ital. 38: 409. 1931
	18	Levan, Hereditas, 20: 289. 1935
	16, 22	Garber, Amer. J. Bot. 31: 161. 1944
	19	D'Amato, Caryologia 1: 291. 1949
neriniflorum	16, 17	Sato, Jap. J. Bot. 12: 57. 1942

MATERIALS AND METHODS

Bulbs of *Nothoscordum felipponei* were collected in 1958 at Verdun, Mina Dept., Uruguay. They were cultivated in my private collection where they flowered each year.

Toot-tips were pre-treated in saturated aqueous solution of paradichlorobenzene for nearly four hours, fixed in Carnoy 3 :1 for 48 hours, washed in distilled water, hydrolyzed in 2 normal hydrochloric acid, and stained in acetic-orcin solution. The drawing was made with a camera-lucida at a table magnification of approximately X2300, and reduced by about 22% in reproduction (see Fig. 22). Preparations were made permanent by removal of the cover slips, smearing cover slips with Mayer's albumen, dehydrating both slides and cover slips, and mounting in Euparal.

As shown in Fig. 22, the diploid chromosome number of *Nothoscordum felipponei* is 2n=10, a number not previously reported in this genus.

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HYMENOCALLIS AZTECIANA, SP. NOV.

HAMILTON P. TRAUB

In 1966 Mr. Horace Anderson of Leucadia, Calif., presented two potted plants of a *Hymenocallis species* which had been collected by his friend Sra. Jacoba Garcia de Frias near the small ranches of Cabos and Batio about three hours' walk from the City of Jalpa, in the State of Jalisco. One was a flowering-size bulb, and the other a smaller seedling. When the larger plant flowered in June, 1966, it was at once apparent that it was new to science. It had a prominent, thick pseudo-stem produced by the sheathing of the leaves below. While annotating the *Hymenocallis* specimens from the Missouri Botanical Garden Herbarium at about the same time, it was noted that D. P. Gregory & G. Eiten no.

254 (MO 1744709), "State of Jalisco, Cerro Viego, south face, above Zapotitan de Hidalgo, a village about 1 mi. n. of Highway Mex. 15; about 25 mi. due s., or 45 road mi. from Guadalajara. Shaded woods, rich black loam, alt. approx. 2300. Tepalsegs narrow, white, carnation odor. June 28, 1956", is identical with the plants obtained from Mr. Anderson. This served as verification of the species.

Since the ancient inhabitants of Mexico have been relatively neglected in the naming of plants, the new species has been named for the Aztec Amerindians, *Hymenocallis azteciana.* The plant is easily cultivated in a rich loamy soil mixture, and in at least half shade.

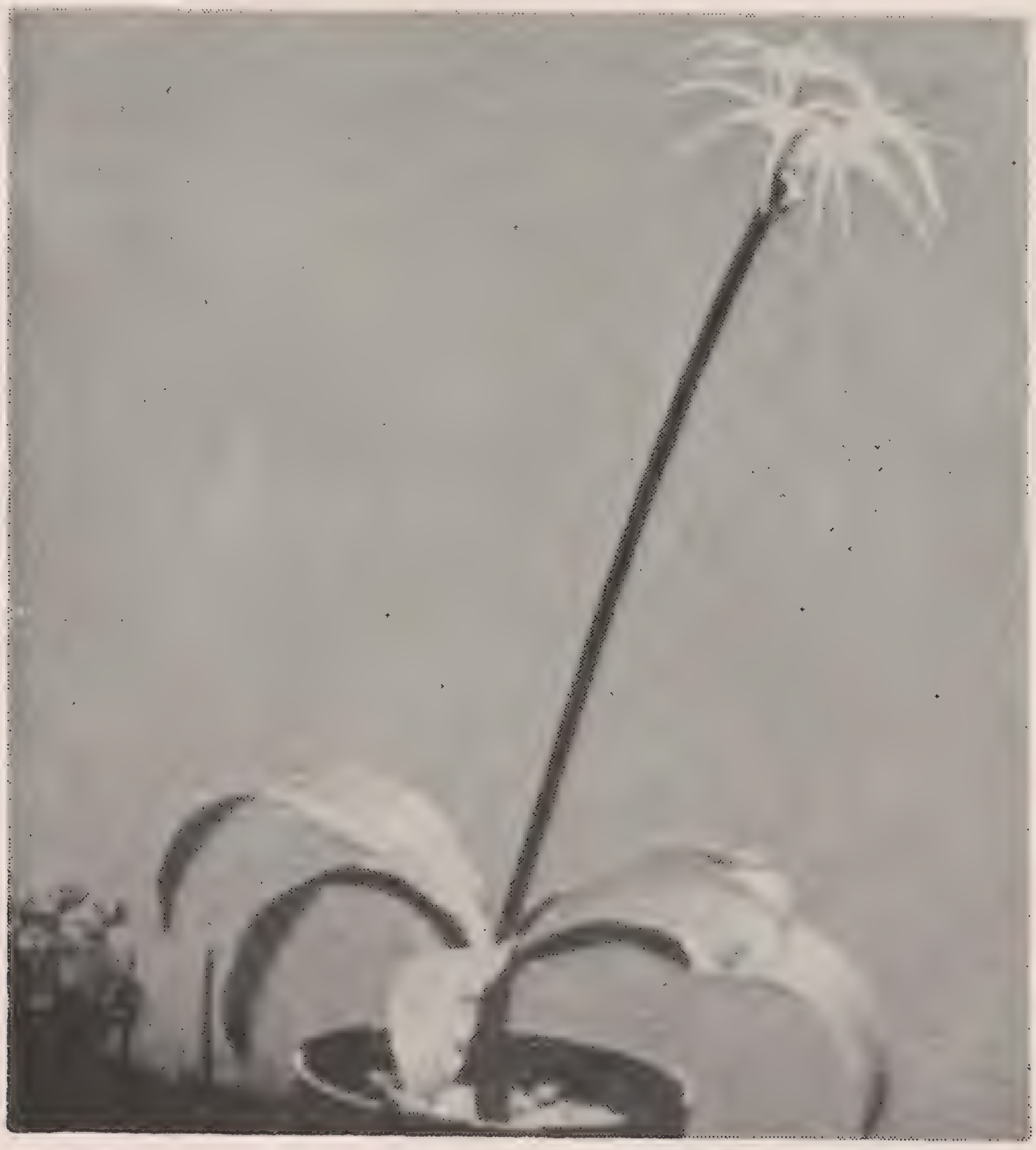

Fig. 23. **Hymenocallis azteciana** Traub, from the State of Jalisco, Mexico.

Hymenocallis azteciana Traub, *sp. nov.*

Foliis liberis 5 anguste ellipticis deorsum vaginatis, pseudocaulem validum tubulosum 11.5 cm. longum 2—3 cm. latum conficientibus; scapo usque ad 63 cm. lato; umbella 9-flora; floribus albis viridibusque; ovulis per loculam 5; tubo tepalorum usque ad 6.4 cm. longo; segmentis tepalorum gracilibus 10.5—11.3 cm. longis; cupula staminali 2.7 cm. longa; filamentis 4.5 cm. longis; antheris versatilibus; polline auranteo; stigmate capitato.

Bulb globose, 5.5 cm. long, 4 cm. in diam., bulb-neck 4 cm. long, 2.2 cm. in diam. Free sessile *leaves* 5, narrowly-elliptic, 7.5—9.3 cm. long, acuminate, 2.9 cm. wide at the base, up to 8.3 cm. wide at the middle;

green above, mid-rib lighter green, prominently keeled whitish to light greenish, and glaucescent on the under side at first, later turning green; sheathing below, forming a thick pseudo-stem, 8—11.5 cm. long, 2.1x3.1 cm. in diam., somewhat flattened, with roundish edges, deep green reticulations on lighter whitish-greenish background. *Scape* up to 63 cm. long, 1.3x1.7 cm. in diam. (base), 1x1.3 cm. in diam. (apex), medium green, flattish, with rounded edges, solid. *Spathe-valves* 2, lanceolate, 9.5—10 cm. long, 3 cm. wide and overlapping at the base, acute or bluntly acute; 2 bracteoles relatively wide, the remainder smaller; green at first, changing to brown on drying. *Umbel* 9-flowered; flowers first opening in the evening, white, except ¼ of tepaltube green, upper ¾ of filaments and style, green; tepalsegs spreading, florets straight in bud, tepaltube curved in lower ⅓ on flowering; delightfully perfumed. *Ovary* sessile in the umbel, oblong, 1.3 cm. long, 6 mm. in diam.; ovules 5 per locule. *Tepaltube* 6.3—6.4 cm. long, 5 mm. in diam. (base), 8 mm. in diam. (apex). *Tepalsegs* linear acute; setsegs 11.3 cm. long, 5 mm. wide; petsegs 10.5 cm. long, 6.5 mm. wide. *Staminal cup* 2.7 cm. long, narrowly funnel-shaped, including the tubular base (1.2 cm. long); *filaments* 4.5 cm. long; *anthers* 2.4 cm. long, attached toward one end below the middle, versatile, pollen orange-colored. *Style* overtopping the stamens; stigma capitate.

Holotype: Traub No. 1031a+b+c (TRA), 6-8-66, grown from bulb collected by Sra. Jacoba Garcia de Frias about three hours' walk from the City of Jalpa, State of Jalisco, Mexico. *Paratype:* D. P. Gregory & G. Eiten No. 254 (MO 1744709), State of Jalisco, Cerro Viego, south face, above Zapotitan de Hidalgo, about 1 mi. n. of Highway Mex. 15., June 28, 1956.

SPREKELIA CHROMOSOMES

W. S. Flory and S. Bose,

Wake Forest College and University of Calcutta

During the past 30 years several persons have reported chromosome numbers for the Mexican monotypic *Sprekelia formosissima.* These numbers have varied somewhat, but have been high in each case. Somatic chromosome numbers of approximately 110 were reported by Inariyama (1937), of from 110 to 117 by Sato (1938), of about 121 by Snoad (1952), and of 116 by Mookerjea (1955).

Several tentative counts, on commercial bulbs of *Sprekelia,* were made, some 15 years ago, with approximately 120 chromosomes being found at somatic metaphase. In October, 1952, a number of bulbs of this species were collected in a barranca just west of Cuernavaca, and these were found to each have 60 somatic chromosomes. When these Cuernavaca bulbs matured they produced flowers with narrower perianth segments than the flowers from commercial bulbs. Shortly thereafter, a more detailed analysis of *Sprekelia* chromosomes was started.

Thirty-two plants were selected for these studies. Six were from commercial sources, with the type flower most frequently observed. Five with narrower-segmented flowers were from near Cuernavaca. Twenty-one bulbs were selected, from a large supply furnished by Dr. T. W. Whitaker; these particular selections produced flowers with a larger, wider-segmented appearance.

Details of the study have been described in several recent reports (Bose and Flory, 1965; Flory and Bose, 1966). The present summary is provided for the readers of Plant Life at the request of its editor.

As indicated above, the plants from Cuernavaca each had 60 somatic chromosomes. These ranged from 5 to 12 microns in length, following a pretreatment of the root tips for 4 to 6 hours in .2% colchicine. These 60 chromosomes could be divided into 4 types, designated A (2), B (12), C (44) and D (2). The A pair of chromosomes was the longest, and had near-median centromeres. The B chromosomes were the shortest, with 4 of these (B_1) being about 2.7 microns long and having near-median centromeres, while 8 (B_2) averaged 4.2 microns in length and had submedian constrictions. The C chromosomes all had subterminal centromeres, and varied from 5 to just over 8 microns in length. The C chromosomes could be divided into 6 subtypes (C_1, C_2, C_3, C_4, C_5 and C_6) on the basis of different lengths and variation in centromere positions. The two D chromosomes had subterminal centromeres, and averaged 5 microns in length—excluding the satellite subtended by each.

In 6 commercial bulbs with usual flower types the 2n chromosome number was about 120. From 12 cells in which unquestioned counts were recorded the following 2n numbers (with number of times) were observed: 117 (1), 118 (3), 120 (2), 122 (1), 123 (3), 124 (1) and 127 (1).

Of 21 bulbs producing apparently larger flowers, one was 2n=ca. 150; in 20, 2n=ca. 180. Unquestioned counts in 7 cells of the plant with about 150 chromosomes showed the following 2n numbers (with number of times observed): 144 (1), 148 (2), 150 (2), 151 (1), 154 (1). Unquestioned counts in root tip cells of plants with about 180 chromosomes (with number of times observed) were: 164 (1), 165 (2), 167 (2), 169 (2), 172 (4), and 178 (2). It has been determined that the same major types of chromosomes are present in the 2n= about 120. 150 or 180 plants, as in the 2n=60 plants from Cuernavaca, and in the same proportions. This is also true of the subtypes of chromosomes B and C.

It is likely that increase in chromosomes to the high numbers encountered here would in itself decrease mitotic efficiency because of crowding, or some other disturbance of nuclear balance. This could plausibly account for higher than expected numbers of chromosomes entering some cells, with lesser numbers going to sister cells. It could explain the number of cells with more or less than 120, 150, or 180 chromosomes in the *Sprekelia* euploid series. Such chromosome crowding caused by increase of chromosome number was suggested by Menzel and Brown (1952) as a probable cause for the varying chromosome numbers associated with mosaic formation in their hexaploid (2n=78) *Gossypium* hybrids. With considerably higher numbers of chromosomes, in most of our *Sprekelia* accessions, such crowding would here seem an even more likely cause of uneven division resulting in cells with aneuploid numbers.

BASIC CHROMOSOME NUMBER IN **SPREKELIA**

With a euploid series of 60, ca. 120, ca. 150, and ca. 180 chromosomes being known, a base number of 30 chromosomes for Sprekelia occurs, of course, as a strong possibility. If this is the case, then taxa which are essentially diploid, tetraploid, pentaploid and hexaploid have been dealt with. Actually, in counts with races having more than 60 chromosomes, cells which are aneuploid deviates are more frequent than are those with exact multiples of 30 chromosomes. The numbers of each different type of chromosome observed would seem to substantiate the reasoning that 30 is a base number; only 2 chromosomes of type A, 2 chromosomes of type D, and 4 chromosomes of type B_1, have been observed with 2n=60, with similar representation of these types in the races with higher numbers.

It is conceivable, and perhaps more logical, to think that a basic number of n=30 was derived, at least, from a lower base number. The most recent arrangement of the genera of Amaryllidaceae (Traub, 1963) places *Sprekelia* in tribe Zephyrantheae. In this tribe *Habranthus, Cooperia, Zephyranthes,* and perhaps other genera, quite obviously have 6 as a basic chromosome number (Flory, 1958). It seems reasonable to suspect that the basic chromosome number in *Sprekelia* also is 6, rather than 30. If 6 is the base number in *Sprekelia,* it would mean that in the process of karyotype evolution, translocations, or other cytological changes have occurred, since the chromosome types now encountered in *Sprekelia* are not present in the proper numbers to satisfy this conception, otherwise. It is of probable significance that *Sprekelia* occurs in geographical areas where *Zephyranthes* is represented by a number of species, and where *Cooperia* and *Habranthus* are also prevalent.

Data has also been secured on perianth segment length and width, and on certain other flower and inflorescence characters, where 2n=60, ca. 120 and ca. 180. A positive correlation is apparent between flower size and chromosome number.

SUMMARY

It has been found that an approximate euploid series of 60, about 120 (118 to 124), about 150 (148 to 155) and about 180 (164 to 178) occurs in *Sprekelia.* The chromosomes are comparatively large, furnishing a total chromatin mass suggested to cause crowding resulting in mitotic irregularities and frequent aneuploidy, especially where numbers are in excess of 100.

In general, the higher chromosome plants produce the largest flowers, with a positive correlation between flower size and chromosome number. Selection for commercial flower types in *Sprekelia* has quite apparently been accompanied by the unconscious selection of plants with increased chromosome number.

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AMARYLLIS ARGILAGAE SP. NOV.

Hamilton P. Traub

In the 1966 issue of Plant Life (pages 41—42), Dr. Joseph C. Smith gave a general description of an *Amaryllis* species collected by Dr. C. G. Ruppel on the banks of the Uruguay River in the Province of Cor-

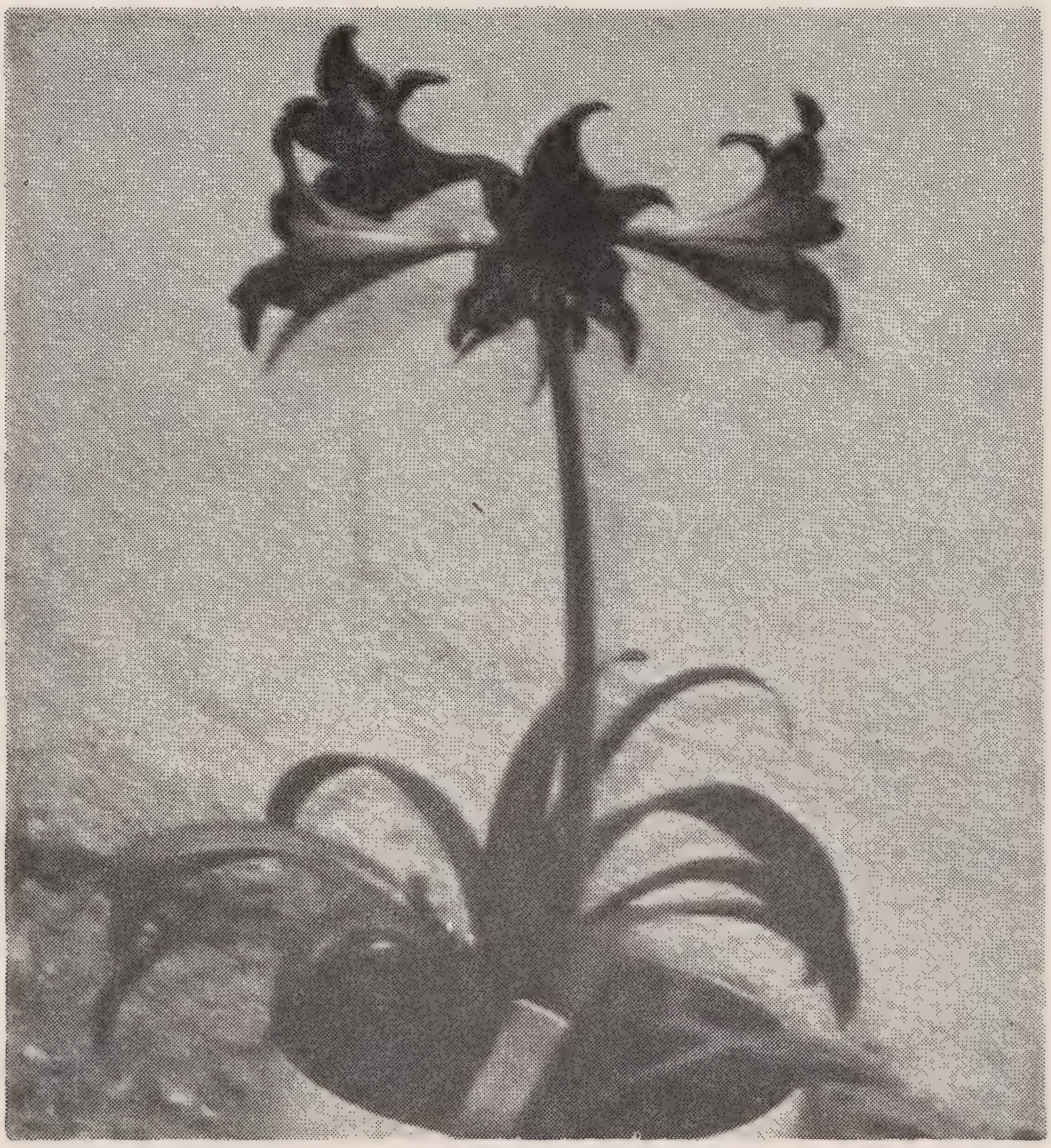

Fig. 24. **Amaryllis argilagae** Traub, the new dwarf **Amaryllis** of the Striata Alliance. Photo by Dr. C. G. Ruppel.

rientes, Argentina. This plant flowered for Dr. Joseph C. Smith in 1965 when the holotype was prepared. This species was also collected by the United States Crops Exploration Division. Plants were sent to Dr. Thomas W. Whitaker who flowered it in 1966.

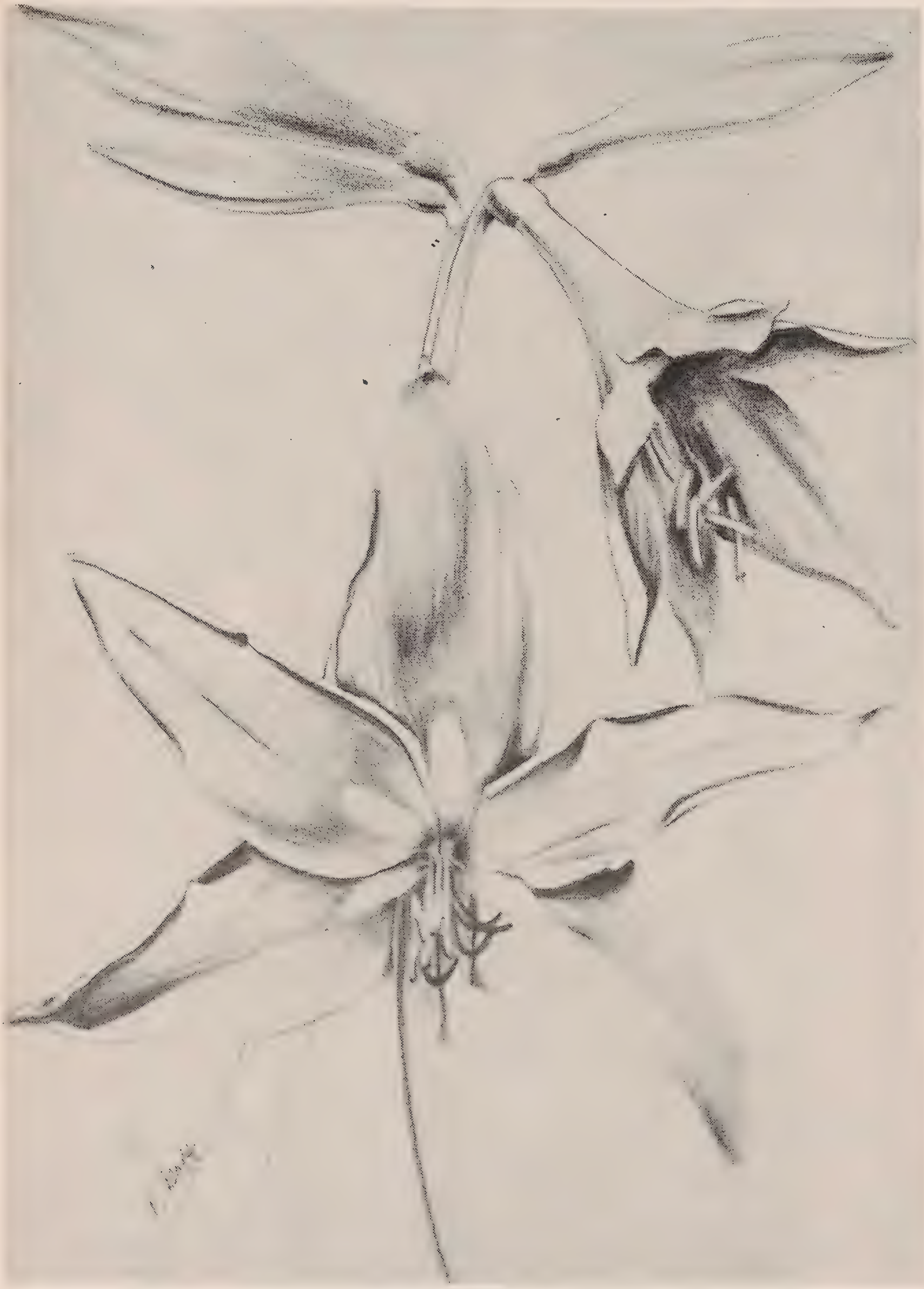

Fig. 25. **Amaryllis argilagae** Traub, after a pencil drawing by Prof. Penrith Goff.

At the request of Dr. C. G. Ruppel, the species is named in honor of his good friend, Mr. Paul Argilaga.

Prof. Penrith B. Goff, of the University of Kentucky, made a pencil drawing of the species from a color slide furnished by Dr. C. G. Ruppel. This is reproduced in Fig. 25.

Amaryllis argilagae Traub, sp. nov.

A. striato affinis sed minor; bulbo parvo 3.3 cm. longo 2.7 cm. diametro bulbosis numerosis gerenti, prope basin squamato; folis usque ad 7 oblanceolatis; umbella 4-flora; floribus cinnabarinis, tepalis 6.5—7 cm. longis initio regularibus demum gradatim aliquantum irregularibus, tubo tepalorum 1.5 cm. longo.

Bulb small, pear-shaped, 3.3 cm. long, 2.7 cm. in diam., neck very short (8 mm. long); plant is related to *Amaryllis striata,* and like it produces numerous bulblets, *Leaves* up to 7, more or less evergreen, usually 18-22 cm. long, (up to 38 cm. long under cultivation in very rich soil), oblanceolate, 1.3 (—1.7 in well-fertilized plants) cm. wide (base), 2.3—2.6 (—3.6 in well fertilized soil), cm. wide above the middle, bluntly acute, deep green. *Scape* up to 17 cm. long, slightly compressed, with round edges, 8x10 mm. in diam. (base), 5x8 mm. in diam. (apex), dull green, reddish near the base. *Spathe-valves* 2, lanceolate, tinged reddish, 4.2—4.5 cm. long, apex acute. *Umbel* 4-flowered, flowers held more or less horizontally, at first tepalsegs are regular, gradually changing to somewhat irregular; the upper setseg and 2 side setsegs reflexed, 2 side petsegs twisted in upper 1/3, color vermilion (HCC 18/1), white band in center of segs about 2/3 up, except band very narrow and only ¼ up in lower petseg; filaments and style vermilion. *Pedicels* 0.6—0.8—1.7—2.2 cm. long at anthesis. *Ovary* 8 mm. long, 5 mm. in diam., green. *Tepaltube* 1.5 cm. long. *Tepalsegs*: *setsegs*: upper, 6.9 cm. long, 2.2 cm. wide, oblanceolate, acute; 2 side setsegs, 7 cm. long, 1.6 cm. wide, narrowly oblanceolate, bluntly acute; *petsegs*: 2 side, 6.5 cm. long, 2 cm wide, oblanceolate, falcate, acute; bottom petseg 5.7 cm. long, 0.7 cm. wide, very narrowly lanceolate, acute. *Paraperigone* apparently absent. *Stamens* about 2/3 as long as the segs, attached slightly below the apex of the tepaltube. *Style* shorter than the segs, and slightly longer than the longest stamens; anthers 4 mm. long, oblong, pollen creamy-white; stigma trifid, lobes 2 mm. long.

Holotype: Joseph C. Smith s.n. (= TRA 1014), cult. La Mesa, Calif., 10-28-65, from bulbs collected by Dr. C. G. Ruppel, Uruguay River, Santo Tomé, Corrientes, Argentina. Paratypes: #768 TRA, USDA P. I. 202235, Rio Grande do Sul, Brasil, 3-11-60; and #1028 TRA, La Jolla, Calif. 6-1-66, 6-1-66.

Notes.—This is the species discussed by Dr. Joseph C. Smith in the 1966 PLANT LIFE, page 44. It is particularly valuable to the breeder interested in miniature hybrid Amaryllis. We are grateful to Dr. C. G. Ruppel who first sent this plant to us from Argentina. The species has been named in honor of Dr. Ruppel's good friend, Paul Argilaga, of Santo Tomé, Corrientes.

AMARYLLID GENERA AND SPECIES

HAROLD N. MOLDENKE

[In this department the descriptions of amaryllid genera and species, particularly recent ones, translated from foreign languages, will be published from time to time so that these will be available to the readers.]

Schoenoprasum lineare H.B.K., Nov. Gen. et Sp. 1: 277. 1816 leaves linear, flat, glabrous, shorter than the striate terete scape; umbels many-flowered. It grows in the mountains of New Spain between Santa Cruz de la Sierra and Mount El Gigante, at 7800 feet altitude. It blooms in September. Bulb ovate, the size of a cherry, with numerous fibers at the base; leaves narrowly linear, flat, striate, glabrous, very thinly membranous at the base, sheathing, 4 inches long; scape erect, terete, striate, glabrous, 5 or 6 inches long; umbels 12- or 15-flowered; flowers pedicellate; pedicels terete, glabrous, 14—18mm. long; spathe ovate-lanceolate, withered, striate, glabrous, half as long as the pedicels, reflexed; calyx-segments oblong, rather acute, patulous, whitish, with a median red longitudinal line; stamens as long as the calyx; filaments glabrous, subulate; anthers oblong; pollen gray; ovary ovate, trigonous; style subequaling the stamens.

Schoenoprasum longifolium H.B.K., Nov. Gen. et Sp. 1: 277. 1816 leaves linear, flat, glabrous, surpassing the terete striate scape; umbels sub-8-flowered. It grows near Queretaro, Aroyozarco, and San Juan del Rio, Mexico, at an altitude of 6090 feet. It blooms in August. Bulb subglobose, the size of a large cherry, tunicate, with numerous fibers at the base; leaves narrowly linear, flat, obtuse, striate, glabrous, conspicuously dilated and very thinly membranous at the base, 8 or 9 inches long, 2 mm. wide; scape erect, terete, striate, glabrous, 6 inches long; umbels sub-8-flowered; flowers pedicellate; pedicels subequal, glabrous, patulous, an inch long during anthesis, an inch and a half long when in fruit; spathe bifid, reflexed, the segments ovate-lanceloate, acuminate, striate, withered, glabrous half an inch long; calyx segments lanceolate; stamens shorter than the calyx; filaments subulate; capsule oblong the size of a small pea; seeds angulate, black.

Haemanthus canaliculatus M. R. Levyns, J. S. Afr. Bot. 32: 73-75, pl. 1. 1966 bulbous very smooth herb; bulb about 9 cm. in diameter, the tunic divided into 2 parts; leaves 2 or sometimes 3, hysteranthous, narrowly linear, involute at the margins, channeled, almost 36 cm. long; peduncle thick, rosy; bracts lanceolate, slightly acute (we would say subacute—HNM), reddish, patent; flowers numerous, crowded, reddish; perianth tube about 5 mm. long, the lobes about 29 mm. long; berry globose; seed ovoid, chestnut-colored, shiny. Betty's Bay and Rooi Els, western Cape Province.

Allium tubiflorum Rendle, J. Bot. Lond. xliv: 44-45, pl. 476, figs. C, 8—11. 1906 plants glabrous, a foot tall or smaller; bulb ovate to subglobose, solitary, the tunic whitish, scarious, entire; stem erect, subcompressed, rather roughly striate-angulate, leafy at the base, slightly surpassing the narrowly linear leaves; spathe 1-valved, laterally split, shortly acuminate, about half as long as the loosely many-flowered umbels; pedicels unequal, 3 or more times longer than the perigonium; petals deep rose, united at the base into a small cup, finally reflexed, oblong, obtuse, marked with a deeper colored median nerve (=vein), more than twice as long as the stamens; filaments subulate, springing from the tube of the perigonium; ovary ovoid, crowned with a subequal style and 3-lobulate stigma.

Tristagma chubutense Gandoger, in Bull. Soc. Bot. France 1919, 66: 292. 1920. It differs from *T. nivale* by its rigid somewhat broader leaves which are not circinate at the apex, the bracts, flowers, tube and divisions of the perigonium at least half smaller. It grows in Patagonia, along the river Carrenlenfi, Chubut (Skottsberg no. 541). Scape enveloped at its base by broad, white, membranous scales; flowers 2—3 cm. long, the tube 10—11 mm. long, the segments recurved-stellate, sublinear; root thickened-fibrous. The remaining specimens sent by Philippi from the Chilean Andes perhaps represent a new species with the circinate leaves half as long as the scape, the (perigonium) tube deeply striate (along with the segments), at least 2.5 cm. long; hence should be named *Tristagma philippi* Gandoger.

Hymenocallis traubii Moldenke, *sp. nov.* Planta nana 10—17:5 cm. alta; foliis 3 vel 4 lanceolatis 7.5—12 mm. latis; umbella biflora; floribus viridibus albisque satis fragrantis; ovario subsessili usque ad sessili oblongo; ovulis per loculo 4 vel 5; tubo tepalorum 3.3—3.9—4.6 cm. longo; segmentis tepalorum linearibus usque ad angustissime ellipticis 8.5—10 cm. longis; cupula staminali 3.5—4.5 cm. longa, basi breviter tubuloso sursum late infundibuliformi; filamentis 5.3—5.5 cm. longis; antheris introrsis erectis; polline flavo. Holotype: H. P. Traub #1056 (TRA), 7—15-1966; isotype #1057 (TRA); grown from bulbs collected by E. L. Brasol, near Daytona Beach, Florida.

Nerine x traubianthe Moldenke, *hybr. nov.* Planta inter N. filifoliam ♀ et clones varios hybridos Nerine ♂ hybrida, vigorem hybridum manifeste praebentes; scapis longissimis; floribus ilis N. filifoliae similibus sed plus majoribus; foliis linearibus 6 mm. latis. Holotype: H. T. Traub #1063 (TRA), 10-29-66.

Chlidanthus x *traubii* Moldenke, *hybr. nov.* Plantae hybridae reciprocae inter *C. fragrans* et *C. boliviensis;* habitu intermediae. Holotype: Traub #905 TRA, 5-14-62; paratype #910 TRA, 5-24-62.

ALLIUM TRAUBII SP. NOV.

T. M. Howard, *Texas*

While collecting various bulbous plants during my plant exploration excursions into Mexico and Guatemala, I have at various times collected a number of unidentified summer- and autumn-flowering *Allium* species in growing (and sometimes in flowering) condition. One of these, taken on Labor Day (September 6, 1965), in the State of Nuevo Leon, west of Monterrey, on top of a dry mountain just inside the Nuevo Leon-Coahuila State line, near the Coahuila border, was in full bloom. The mountain was reached by an excellently maintained new road which led to a tower at the summit, presumably a satellite tracking station or relay station, just off highway 40 (Saltillo-Monterrey highway) and Cuesta de los Muertos (Grade of the Dead). The elevation was approximately 6000 feet (approx. 1830 m.). The membranous coated bulbs reproduced vegetatively by division, and bore loose umbels of 8-16 flowers with light lavender tepals on scapes 15—25 cm. tall. This same *Allium* was taken again a month later in flower at Cerro del Obispado, a historic landmark (battle ground) within the western edge of the City of Monterrey, State of Nuevo Leon, October 3, 1965.

It differs markedly from the previously known species such as *A. glandulosum* and *A. kunthii* which are robust plants, with relatively long upright leaves. In the Nuevo Leon plant, the leaves are relatively shorter, more slender, lax, glaucescent, medium green on the upper side, prominently 3-ridged on the underside, particularly when cultivated. It was given the collection number Howard #65-84. This species, along with several others from Texas, Mexico, and Guatemala were sent to Dr. Hamilton P. Traub in 1966 for study and identification. Dr. Traub informed me that several of these were apparently new, and that he would be pleased to assist in identifying them. It is with much pleasure that I name this new *Allium* #65-84, *Allium traubii* T. M. Howard *sp. nov.,* in his honor for his interest in this oft-neglected genus, and without whose help the identity of these plants might have continued to remain obscure. *Allium traubii* should be a welcome addition to the small group of fall-flowering half-hardy Alliums suitable for pot culture in the North and gardens in the South. Sub-freezing temperatures of short duration do not bother them in San Antonio, Texas and it is likely that they will be hardy further north as well.

Allium traubii T. M. Howard, *sp. nov.* Bulbo oblongo, deinique in bulbis duis verticaliter fisso, tunicis membranaceis; foliis deorsum vaginatis, partibus liberis 4—6, 11—19 cm. longis 2.5—2.75 mm. latis, supra glaucescentibus, subtus 3-carinatis; scapo subtereti; umbella 10—16-flora; filoribus campanulatis perpallide lavandulaceis, vena media fusciora; pedicellis usque ad 1.2 cm. longis; staminibus quam tepalibus leviter brevioribus.

Bulb oblong, membranous coated, splitting vertically into two bulbs; leaves sheathing below, free portions 4—6, glauscent on upper surface, 3 ridged on under side, 11—19 cm. long, 2.5—2.75 mm. wide; scape subterete; umbel 8-16 flowered; flowers campanulate, very pale lavender, deeper mid-vein; pedicels to 1.2 cm. long; stamens slightly shorter than the tepals. Semi-arid mountains of Monterrey and vicinity, State of Nuevo Leon, Mexico. September-October.

The specimens have been deposited in the Traub Herbarium. Holotype (holonomenifer): T. M. Howard 65-84 (TRA No. 1061), 10-18-66, Mexico: State of Nuevo Leon, W. of Monterrey. Paratypes: T. M. Howard, n. s. (=1064 TRA), w. of Monterrey, Mex.; T. M. Howard n. s. (=1066 TRA), Cerro del Obispado, Mex.

CRINUM STRICTUM HERB, IN THE GUADALUPE LOWLANDS, TEXAS

Fred B. Jones, *Corpus Christi, Texas*

On Nov. 21, 1958, while doing field work in the marshy lowlands of the Guadalupe River between Green Lake and the shore of San Antonio Bay, I noticed a small patch of Crinum on the far side of a wide and rather deep ditch paralleling Highway 35 which traverses the area. The ditch was filled with water from recent rains, but by taking a circuitous route, I was able to reach the clump and take several scapes and leaves for pressing and a bulb or two for planting in my garden. The specimens became my No. 2698 and were deposited in the Welder Wildlife

Foundation and my personal Herbaria (two sheets were later sent to the Traub herbarium in La Jolla, California). The accompanying illustration shows the general aspect of the inflorescence (Fig. 26).

The bulbs were seated about 6 in. deep in the mud, connected by thick underground stems (rhizomes) and anchored by numerous thick-fleshy roots. The bulbs were about 4 cm. thick near base and gradually narrowed upward. Leaves were about 60 cm. long and 4-4.5 cm. wide. Scapes, 50-60 cm. long. Spathes about 6 cm. long. Umbels, at least 3 of them, 6-flowered. Tepaltubes 10-11 cm. long, about 6 mm. in diameter, slightly curved above. Tepalsegs about 8 cm. long, 1.5-2 cm. wide, white, spreading or somewhat recurved (the flowers had opened at least 16 hours before). Stamens ascending, about 5.5 cm. long, purple. Styles surpassing the stamens by about 2 cm., purple. On the fruiting umbels, the tepaltubes, all but the upper 1 or 2 cm., had become rather thick-fleshy and stiffish.

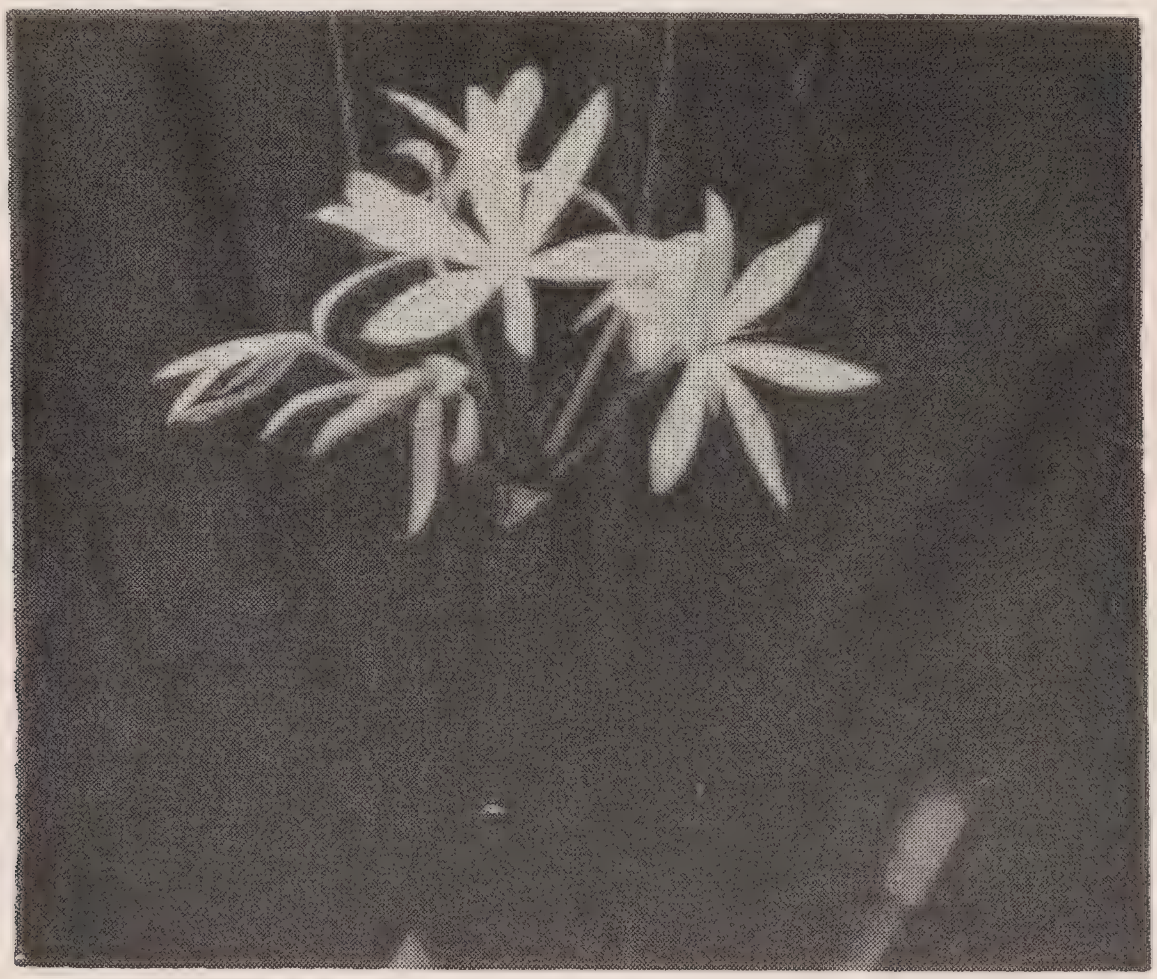

Fig. 26. Flower scape of **Crinum strictum.**

Checking available manuals and floras, I noted that Small, in *Manual of the Southeastern Flora* (1933) allowed *Crinum americanum* L. in Texas and gave Spring-Fall as its blooming season. His description of the species, however lacking in details, seemed to fit the Guadalupe lowland plants, so, being fairly sure that no other species had been reported from the state or was even to be expected, I determined our plant as *C. americanum* and it was so listed in the checklist of South Texas plants published in 1961 by the Welder Wildlife Foundation (Jones, F. B., C. M. Rowell, Jr. and M. C. Johnston, *Flowering Plants and Ferns of the Texas Coastal Bend Counties*.

On several collecting trips to the lowlands made at different times in the summer and fall months of 1959, 1960 and 1961, I saw not a single Crinum. I presumed that the bulbs simply were out of bloom at these times, or if blooming, were hidden by tall weeds, grasses or woody vegetation. When I visited the area on Nov. 2, 1962, however, Crinums were again blooming. There were several small patches in the lowlands near the highway but none could be seen along the ditches. I very much wanted to collect bulbs of the plant, for those that I had taken along the ditch in 1958 had failed to become established in my yard. Looking about for a patch that could be reached without wading through water or mud, I came upon a number of bulbs lying on the ground near the site of a bridge that had been torn out recently (a new highway paralleling the old one was near completion). These bulbs were taking root as best they could and were putting out a few leaves. I took four of the larger ones for my garden.

The four bulbs leafed out in the spring of 1965 and bloomed in the earlier part of June. Two of them produced a second scape. The umbels were 2-3-flowered and the seed were allowed to mature. These germinated, incidentally, where they fell. In the fall, the older leaves yellowed and fell away but there remained a bunch of young, undeveloped leaves at the top of the bulbs. These, however, were eventually killed by frost or sub-breezing temperatures (not below 27 F.) so that the bulbs were leafless and apparently dormant.

In the spring of 1966, the first leaves appeared and about June 12, the first scapes were sent up. Flowers were open on June 23 and I took a scape for my herbarium (No. 6883) and on July 2, immature fruiting material (No. 6890). By pulling away the soil, I found that the bulbs were about 10 cm. long, including the basal plate, and 4-5 cm. thick near base. They were tapered upward and about 2 cm. in diameter at ground level. Leaves were about 60 cm. long and 4 cm. wide. Scapes 50-56 cm. long. Umbels 3-4-flowered. Spathes 8.5 cm. long. Tepaltubes 12-14 cm. long, slightly curved above. Tepals 8-10 cm. long, 1.3-1.7 mm. wide, spreading-recurved, white with traces of purple. Stamens and style purple above, whitish below. Anthers about 1 cm. long, the pollen yellow.

In 1965, I noticed that the buds drooped until nearly ready to open, so I made it a point to observe this peculiar behavior in 1966. When the spathes split, the developing buds are erect, but after a few days of growth, they assume a drooping position, that is, the tepaltubes become arched. On their opening day, they rise to an ascending or even erect position, that is, the tepaltubes become nearly but not quite straight. They finally burst open just before sundown.

Comparing the specimens of No. 2698, taken in the ditch in 1958, and those of 6883 and 6890, from the bridge in 1964 and grown in an ordinary half-shaded flower bed, I can see no significant differences. Of course the scapes from the ditch have 6-flowered umbels, but the 2-4-flowered umbels produced by the garden-grown bulbs may have been a consequence of insufficient moisture or other inadequacies. Not to be overlooked, too, is the disparity in time of flowering between the garden-grown bulbs which flowered in June in two successive years, and those growing in the wild which, so far as I have been able to determine, bloom in November or in October (there were maturing fruits on some of the November-flowering bulbs). The question of flowering time can only be settled by observing the plants in the lowlands over a period of years.

In the garden, *C. strictum* apparently has no special requirements. It takes about as much space as an ordinary amaryllis, much less than most crinums, and if an occasional young bulb shoots up some distance from the parent, it can be removed if not wanted. The foliage is attractive and graceful, the flowers beautiful and not too fragrant. The blooming season, in my experience, is much too brief, but it could possibly be extended by keeping the soil quite damp or planting the bulbs in a place that stays wet most of the time.

AMARYLLID NOTES, 1967

Hamilton P. Traub

Leucocoryne volkmannii (R. A. Phil.) Engl. ex Traub; *comb. nov.*, syn—*Latace volkmannii* R. A. Phil., Anal. Univ. Chil. 93: 274. 1896; Engl. Nat. Pflamzenfam. 15a: 325. 1930; Traub, Gen. Amaryll. 35. 1963.

Tristagma uniflorum forma *album* (Weathers) Traub, *comb. nov.* Syn.—Weathers, Bulb Book, 117. 1911; *Beauverdia uniflora* f. *alba* Herter, in Boissiera 7: 512. 1943.

Tristagma uniflorum forma *violaceum* (Voss) Traub, *comb. nov.* Syn.—Voss, in Vilmorin, Blumeng. 1116. 1895; *Ipheion uniflorum* f. *violaceum* (Voss) Stearn, Gard. Chron. Aug. 14, 1943, p. 61.

Tristagma uniflorum forma *conspicuum* (Bak.) Traub, *comb. nov.* Syn.—*Triteleia conspicua* Bak., in J. Linn. Soc. Bot. 11: 382. 1871.

Tristagma uniflorum forma *tenuipetalum* (Herter) Traub, *comb. nov.* Syn.—*Beauverdia uniflora* f. *tenuipetala* Herter, in Boissiera 7: 512. 1943.

Tristagma uniflorum forma *roseoplenum* (Herter) Traub, *comb. nov.* Syn.—*Beauverdia uniflora* f. *roseoplena* Herter, in Estud. Bot. Reg. Uruguay IX, Montevideo (1928-1929), color plate & text fig.; Herter, in Boissiera 7: 512. 1943.

Nectaroscordum tripedale (Trautv.) Traub, *comb. nov.* Syn.—*Allium tripedale* Trautv. in Act. Hort. Petrop. 2: 485. 1873.

Pancratium parvum subsp. *malabaricum* (Bak.) Traub, *subsp. nov.* Syn.—*Pancratium parvum* var. *malabaricum* Bak. Amaryll. 119. 1888.

Stenomesson moldenkei Traub, *sp. nov.* (Amaryllidac.), *emend* (Plant Life 22: 62. 1966), Habitat: Peru: near Canta, Prov. Canta, Dept. Lima, on stony soil, alt. 2800-2900 m., Mar. 16, 1950.

Eucharis horsmannii (Bak.) Traub, *comb. nov.* Syn.—*Plagiolirion horsmannii* Bak., Gard. Chron. ii (1883) 38.

Eucharis tenera (Bak.) Traub, *comb. nov.* Syn.—*Calliphruria tenera* Bak. Amaryll. 112. 1888.

Eucharis sanderi subsp. *multiflora* (Bak.) Traub, *comb. nov.* Syn.—*Eucharis sanderi* var. *multiflora* Bak., Bot. Mag. 111: pl. 6831-B. 1885; Amaryll. 111. 1888.

Hymenocallis duvalensis Traub, *sp. nov.* Foliis 3 vel 4 usque ad 56 cm. longis, partibus superioribus linearibus, supra mediam 1.7 cm. latis, basi usque ad 1 cm. angustatis; umbella biflora; tubo tepalorum 5.5—6 cm. longo; segmentis tepalorum 7 cm. longis linearibus 3—4 mm. latis; cupula staminali 2.8—3 cm. longa; filamentis 1.8—2 cm. longis.

Bulb ovate, 3.5—4 cm. long, 2.5 cm. in diam., bulb-neck 6.5—8 cm. long, 1.5 cm. in diam., tunics brown. *Leaves* 3—4, up to 56 cm. long, linear in upper part, 1.3—1.5—1.7 cm. wide above the middle, narrowing toward the base, 1 cm. wide (base), apex bluntly acute. *Scape* 49—50 cm. long, slender. *Spathe* 2-valved, 3.3 cm. long, acute. *Umbel* 2-flowered. *Ovary* sessile, 8—9 mm. long, 5 mm. in diam.; ovules 2—3 per locule. *Tepaltube* 5.5—6 cm. long. *Tepalsegs* 7 cm. long; linear; 3—4 mm. wide, acute. *Staminal cup* 2.8—3 cm. long. *Filaments* 1.8—2 cm. long; anthers 1.4 cm. long, introrse, upright. *Style* overtopping the stamens; *stigma* capitate, minute.

Holotype: *G. F. Weber,* s. n. 4-29-28, Fairbanks, Fla., swamp (FLAS Nos. 6296 and 6297); Isotype—*Lillian Arnold & E. West,* s. n. Apr. 2, 1935, along stream in Hogtown swamp, (FLAS two sheets 6301 & 6302); & Paratypes: *J. R. Harris* C21135, St. Marys River, Ga., May 1. 1921, US No. 143572; *R. M. Harper,* Chatham County, coastal plain, Apr. 30, 1904, US No. 511197; *Chapman Herbarium* s. n. Apr. 1892, Apalachicola, Fla. U. S. No. 784926; *N. C. Fassett* no. 21162, Apr. 21-22, 1941, Escambia County, Fla., east of Pensacola, U. S. No. 1898650.

Notes.—In reviewing the genus *Hymenocallis* Salisb., in the southeastern United States, it was noted that a distinct species in s. e. Georgia and n. e. Florida had in the past apparently been included in a wider concept for *H. rotata* (Ker-Gawl.) Herb. This species is quite distinct and has been named in honor of Duval County, Florida.

Hymenocallis limaensis Traub, *sp. nov.* Parte ⅔ superiore foliorum 1.5—1.9 cm. lata, foliis deorsum angustatis; scapo ca. 28 cm. longo, gracili; spatha lanceolata usque ad 5.5 cm. longa; umbella uniflora; pedicellis 5 mm. longis; tubo tepalorum 4.6 cm. longo; segmentis tepalorum 5.7—6 cm. longis; cupula staminali 2.6 cm. longa infundibuliformi; filamentis 2.5 cm. longis; stigmate breviter 3-lobato.

Bulb 4.3 cm. long, 2.8 cm. in diam., tunics brown. *Leaves* about 3, sheathing below, 1.5—1.9 cm. wide in upper ⅔, acute, narrowing below. *Scape* about 28 cm. long (in specimen), but may be longer; slender. *Spathe* lanceolate, up to 5.5 cm. long, membranous. *Umbel* 1-flowered. Pedicel 5 mm. long. *Ovary* 6 mm. long, 4 mm. in diam. *Tepaltube* 4.6 cm. long, slender. *Tepalsegs* 5.7—6 cm. long, narrow-linear. *Staminal cup* 2.6 cm. long, funnel-shaped. *Filaments* about 2.5 cm. long. *Style* overtopping the tepalsegs; stigma shortly 3-lobed.

Holo-nomenifer (type): Mr. and Mrs. J. N. Rose No. 18634 (US 1319866), flowered in Washington, D. C. greenhouses in 1926 from bulbs collected in the vicinity of Lima, Peru, above Santa Clara.

Hymenocallis sinaloaensis Traub, *sp. nov.* Umbella 2—5-flora; ovario sessili, ovulis per loculam 2; tubo tepalorum 6—7 cm. longo gracillimo; segmentis tepalorum angustissimis linearibus 6.6 cm. longis; cupula staminali 1.6—1.7 cm. longa; filamentis 3.2 cm. longis; stigmate minuto capitato.

Scape slender; umbel 2—5 flowered; ovary sessile, 7 mm. long, 4 mm. in diam.; ovules 2 per cell; tepaltube 6—6.2—6.8—7 cm. long, very slender; tepalsegs very narrow, linear, 6.6 cm. long; staminal cup 1.6—1.7 cm. long; filaments 3.2 cm. long; style overtopping the stamens; stigma minute, capitate.

Holo-nomenifer (type): J. G. Ortega no. 4176 (US 1083825), La Cruz, State of Sinaloa, Mexico, 1921.

Hymenocallis guatemalensis Traub, *sp. nov.* Foliis loratis sub anthesi immaturis usque ad 4 cm. latis; scapo 19—23 cm. longo; spatha lanceolata 5 cm. longa; umbella 5—7-flora; ovulis per loculam 2; tubo tepalorum 8.2—8.4 cm. longo; segmentis tepalorum anguste linearibus 8.2—8.7 cm. longis; cupula staminali 2.5 cm. longa; stigmate capitato.

Bulb globose, 5 cm. long, 4.9 cm. in diam., bulb-neck 2.5 cm. long, 2.1 cm. in diam., tunics brown. *Leaves* immature at flowering time, about 15 cm. long, lorate, acute, up to 4 cm. wide. *Scape* 19—23 cm. long. *Spathe* membranous, narrow, lanceolate, acute, or truncate, 5 cm. long. *Umbel* 5—7-flowered. *Ovary* sessile, 1.2 cm. long, 5 mm. in diam., ovules 2 per cell. *Tepaltube* 8.2—8.4 cm. long. *Tepalsegs* narrow-linear, 8.2—8.7 cm. long. *Staminal cup* 2.5 cm. long. *Style* overtopping stamens; stigma capitate.

Holonomenifer (type): H. Pittier No. 126 (US 472779), Apr. 19, 1905, along the shore of Lake Amatitlan, alt. 1250 m., Guatemala.

Narcissus tazetta subsp. *chinensis* var. *pleniflorus* Traub, *var. nov.*—A forma typica speciei floribus plenis et planta minus valida recedit. A double form *N. tazetta* subsp. *chinensis*. Holotype: Traub #135 (TRA), 11-16-50.

Tristagma uniflorum f. *pauciflorum* Traub, *forma nov.*—A forma typica speciei umbella 2—3-flora recedit.

Hymenocallis floridana subsp. *amplifolia* Traub, *subsp. nov.* A subspeciei typica foliis 2.6—3.5—3.8—4—4.2 cm. (nec. 0.8—1—1.3—1.5—1.8—2 cm.) latis recedit. *Leaves* 2.6—3.5—3.8—4—4.2 cm. wide as contrasted with 0.8—1—1.3—1.5—1.8—2 cm. wide in subsp. *floridana*. Holotype (holonomenifer): F. West, A. N. Tissot & W. B. Tisdale, s.n. May 11, 1935; FLAS 10473 + 10474.

Hymenocallis galvestonensis subsp. *angustifolia* Traub, *subsp. nov.* A subspeciei typica foliis 1.5—1.8—2 cm. (nec. 2.3—2.6—2.8—3—3.2—3.5—3.8 cm.) latis recedit. *Leaves* 1.5—1.8—2 cm. wide as contrasted with 2.3—2.6—2.8—3—3.2—3.5—3.8 cm. wide in subsp., *galvestonensis*. Holotype (holonomenifer): Biltmore Herbarium II/60, Mobile, Ala. Apr. 24. 1899; US No. 980051.

Hymenocallis bolivariana Traub, *sp. nov.* This plant is similar to *Hymenocallis bistubata* Herb. (1844)—See also Sealy, Kew Bull. 239. 1954—in the length (somewhat longer than 5 cm.) and type of the tepaltube, but differs from it in the type of the leaves which are more or less strap-shaped and only 5.8 cm. wide above the middle, narrowed to 2.3 cm. wide at the base, whereas they are subpetiolate, 10 cm. wide in *H. bistubata*—which is more than 4 cm. wider than in our plant. In addition, our plant has a shorter scape, slightly longer tepaltube and longer tepalsegs. Apparently, this plant from Venezuela cannot be equated with *H. bistubata,* and it is named for the Liberator of South America: *Hymenocallis bolivariana* Traub, *sp. nov.*

Foliis loriformibus supra mediam 5.8 cm. latis; umbella 8-flora; ovario sessili; tubo tepalorum usque ad 14.5 cm. longo; segmentis tepalorum 12 cm. longis; cupula staminali 5.5 cm. longa; filamentis 3—3.2 cm. longis.

Leaves strap-shaped, 5.8 cm. wide above the middle, narrowing to 2.3 at the base, apex acute to bluntly acute, 34—35 cm. long. *Scape* above 28 cm. long (preserved only in part). *Spathe* about 6.5 cm. long, ovate, acute. *Umbel* 8-flowered. *Ovary* sessile, oblong, 1.3 cm. long, 8 mm. in diam., ovules 5 per locule. *Tepaltube* 14.5 cm. long. *Tepalsegs* 12 cm. long, linear, 6 mm. wide. *Staminal cup* 5.5 cm. long, tubular for 4 cm. below, funnel-shaped above. Filaments 3—3.2 cm. long. *Anthers* extrorse, versatile. *Style* overtopping the stamens by 3 cm. Holonomenifer: F. D. Smith 182 (US 2121420) sheets 1 & 2, June 6, 1950, Caicara, Monagas, Venezuela.

Hymenocallis repanda Otto & Dietrich, *emend.* Traub. *Hymenocallis repanda* Otto & Dietrich, Allg. Gartenz. 11: 123.. 1843; Sealy, Kew Bull. 240. 1954.

Bulb globose, about 7.5 cm. long. *Leaves* broad-lance-strap-shaped, acute, up to 60 cm. long, 7.5 cm. wide, somewhat upright, flat, rather thin, light green, many-nerved. *Scape* about 60 cm. long, compressed, with sharp edges, upright. *Spathe-valves* 2, acute, whitish, about 5 cm. long. *Umbel* about 10-flowered. *Ovary* sessile, trigonous, 1 cm. long, wider than the tepaltube. *Tepaltube* 10 cm. long, slender, greenish below, whitish above. *Tepalsegs* reflexed, as long as or almost as long as the tepaltube, linear, acute, about 4 mm. wide, the base adnate to the base of the staminal cup, snow white. *Staminal cup* pure white, about 5 cm. long, funnel-shaped, about 2.5 cm. across at the apex, the margins between the filaments slightly wavy. *Filaments* a good 5 cm. long, a little longer than the staminal cup, filiform, green; anthers (versatile), attached below the middle, very narrow-linear, arcuate, (pollen) orange. *Style* overtopping the anthers by about 1.25 cm.

Sealy (1954) indicated that it was described from a ''cultivated plant with leaves like those of the *caribaea*-alliance, and flowers which agree with those of *H. latifolia* except for the staminal cup which is described as almost 5 cm. long, whereas in *H. latifolia* the cup does not exceed 3 cm.'' This is correct, excepting that Otto & Dietrich (1843) indicate that in the case of the tepalsegs, the bases are adnate to the base of the staminal cup which places it in the *littoralis*-alliance.

Eucharis butcheri Traub, *sp. nov.* Foliis 2 petiolatis, laminis ellipticis 11 cm. latis; umbella uniflora; floribus albis; tubo tepalorum parte 4/5 inferiore viridi; pedicellis 8 mm. longis; tubo tepalorum recto 4.8 cm. longo sursum gradatim ampliato; segmentis tepalorum ovatis 2.7 cm. longis 1.6—2.2 cm. latis; cupula staminali nulla; filamentis 8 mm. longis, dente 2 mm. longo basi utrinque ornatis; stigmate late 3-lobato.

Holotype: J. N. Giridlian s. n. (= #1051 TRA), 8—10—66, grown at Arcadia, Calif. from bulbs collected by Harry P. Butcher in Panama.

Section *Caulorhizideum* Traub, *sect. nov.*, Genus *Allium L.* Bulbis caespitosis in rhizomatibus iridoidibus productis; vestimentis bulbi striatis, cellulis elongatis serialibus verticalibus regularis et fibris persistentibus parallelis formatis; foliis planis; ovario rarissime cristato. Type: *Allium validum* S. Wats.

Section *Lophioprason* Traub, *sect. nov.*, Genus *Allium* L. Ovario plerumque cristato saepe manifeste cristato; vestimentis bulbi sine reticulo fibroso persistenti. Type: *Allium sanbornii* Wood.

Subsection *Cernuae* Ownbey ex Traub, *subsect. nov.*, Sect. Lophioprason Traub, Genus *Allium* L. Foliis per scapum ultra 2; ovario cristato; bulbis plerumque elongatis. Type: *Allium cernuum* Roth.

Subsection *Falcifoliae* Ownbey ex Traub, *subsect. nov.*, Sect. *Lophioprason* Traub, Genus *Allium* L. Foliis per scapum 2 (vel 1) saepe planis vel falcatis; cristis ovarii plerumque debiliter evolutis; scapo plerumque complanato; seminibus saepe per modam volutatim despersis. Type: *Allium falcifolium* Hook. & Arnott.

Subsection *Sanbornae* Ownbey ex Traub, subsect. *nov.*, Sect. *Lophioprason* Traub, Genus *Allium L.* Folio per scapum solitario (praeter species una foliis per scapum duis); ovario manifeste 6-cristato, partibus saepe laceratis. Type: *Allium sanbornii* Wood.

Subsection *Acuminatae* Ownbey ex Traub, *subsect. nov.*, Sect. *Lophioprason* Traub, Genus *Allium* L. Species cellulis interioribus vestimentorum interiorum bulbi incrementum secundarium efferentibus plerumque designata; foliis per scapum 2—4, rare 1; ovario plerumque inconspicue cristato. Type: *Allium acuminatum* Hook.

Subsection *Campanulatae* Ownbey ex Traub, *subsect. nov.*, Sect. *Lophioprason* Traub, Genus *Allium* L. Species cellulis interioribus vestimentorum interiorum bulbi incrementum secundarium efferentibus plerumque designata; foliis per scapum plerumque duis; ovario manifeste 6-cristato. Type: *Allium campanulatum* S. Wats.

TRAUB: AMARYLLID NOTES, 1967—continued on page 110.

AMARYLLIDS FLOWERED IN SOUTHERN CALIFORNIA

HAMILTON P. TRAUB

During the year 1966, various amaryllids flowered at the home of the writer in La Jolla, California. Snap-shots were obtained of some of these and are reproduced with this brief article.

CRINUM BRASILENSE

This species was described in the 1966 PLANT LIFE (page 45). It bloomed again on July 4, 1966 when the snap-shot was obtained. As grown in southern California, the leaves appear as a sub-rosette as shown in Fig. 27. It is a beautiful plant, with fragrant flowers, but the flowers are not long lasting.

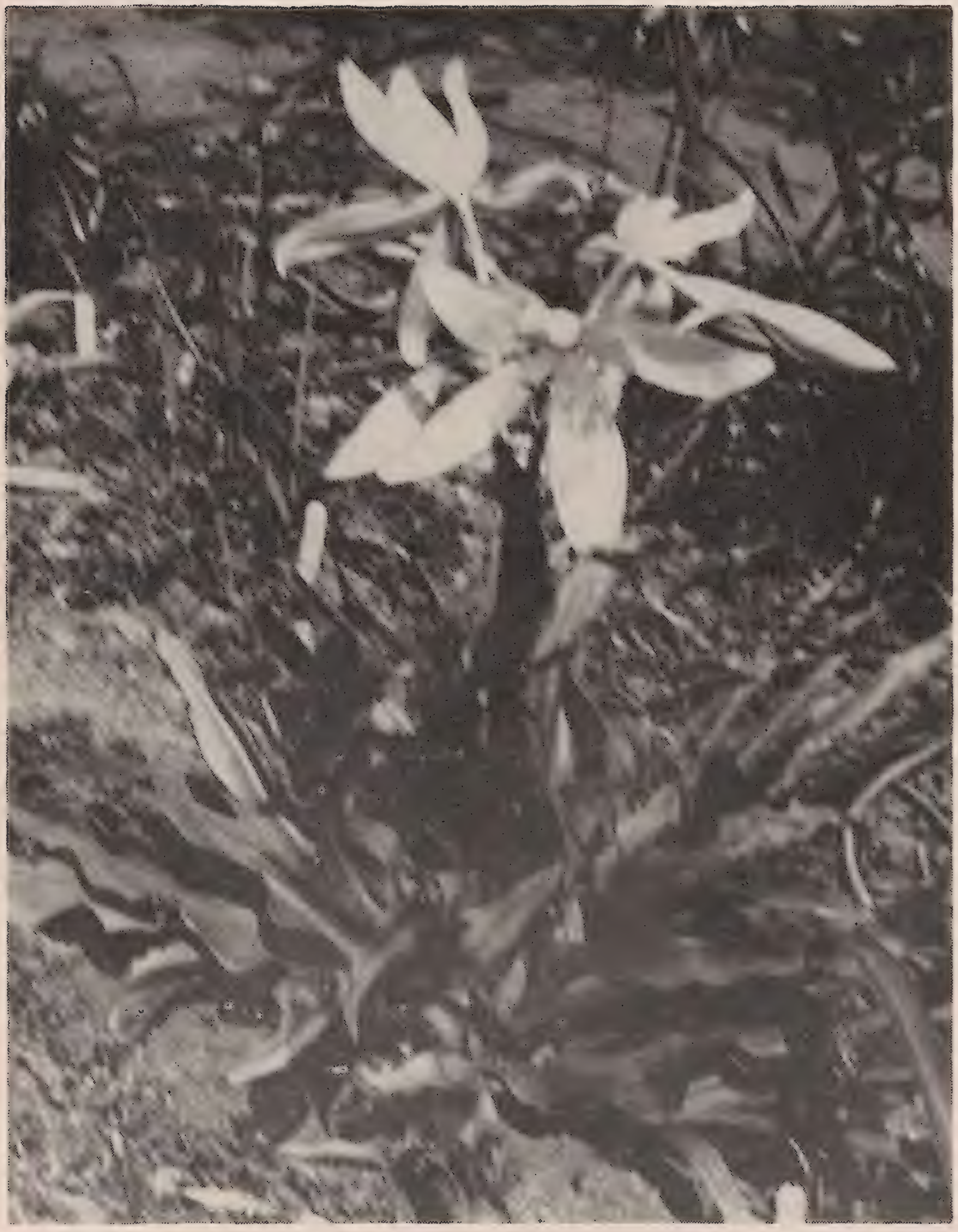

Fig. 27. **Crinum brasilense** as flowered at La Jolla, Calif., July 4, 1966.

CRINUM LUTEOLUM

The two forms of *Crinum luteolum* which were kindly supplied by Mr. William Morris of Australia, again bloomed in 1966 at two different times. The form with relatively long tepalsegs (Fig. 28) is somewhat superior to the one with shorter, wider tepalsegs. During the first blooming period, the plants in each case were selfed, and only one or two seeds were obtained. During the second flowering period, the two forms were crossed reciprocally with surprising results as shown in Table 1.

Table 1. Seeds obtained by crossing two forms of **Crinum luteolum** reciprocally in 1966. A single scape was involved in each case.

	Number of seeds per fruit	Total
Form with short tepalsegs	13—15—13—14—10—11—9—10—10—8—1	114
Form with longer tepalsegs	15—6—6—5—1—3—3	39
	Grand Total	153

Thus it will be noted that when different seedlings are cross-pollinated a large number of seeds were obtained. This makes it possible to increase this beautiful plant very rapidly.

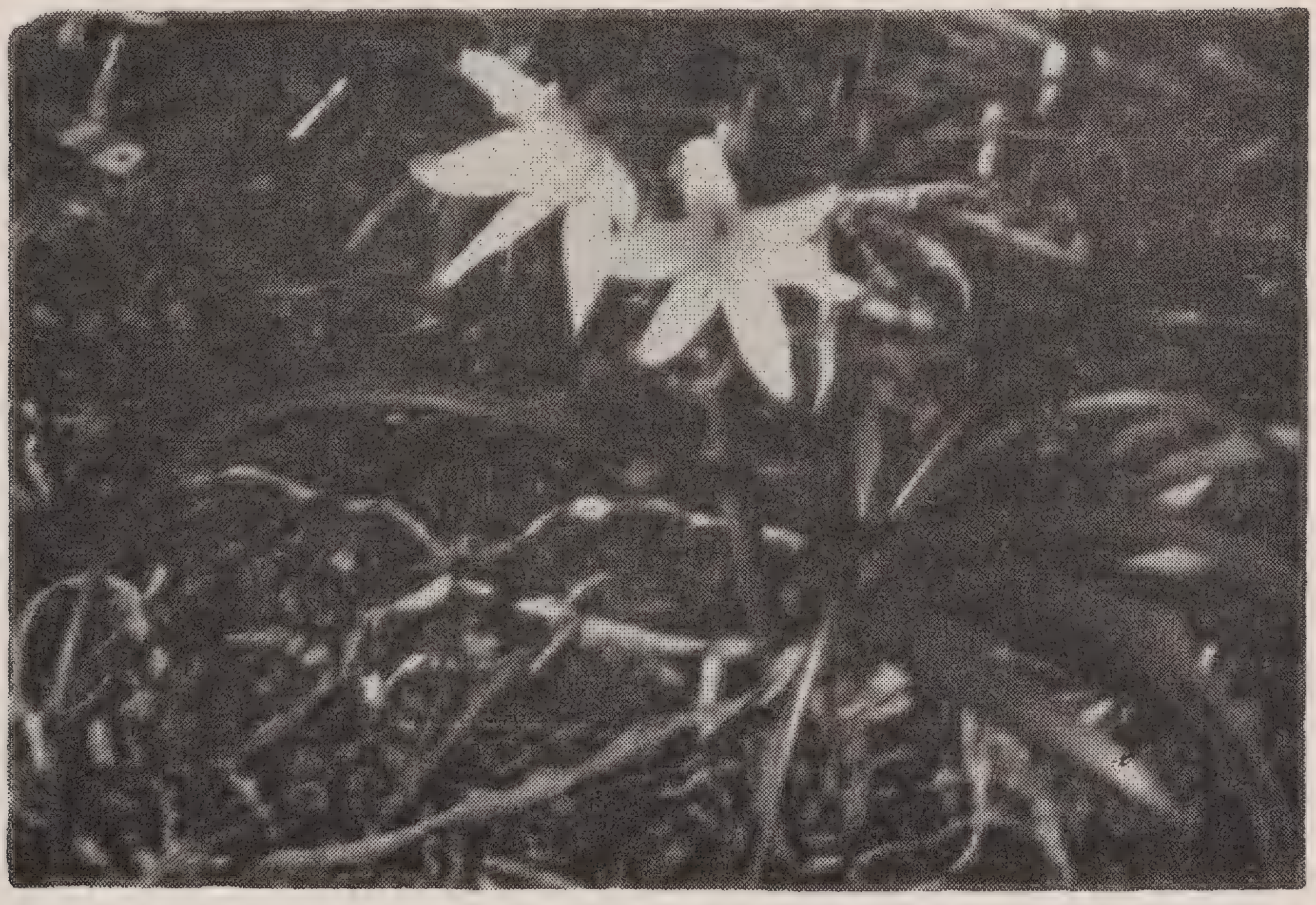

Fig. 28. **Crinum luteolum** Traub & Hannibal, a form with relatively long tepalsegs, as grown at La Jolla, Calif., 1966.

CHLIDANTHUS X TRAUBII

It has been reported before that *Chlidanthus fragrans* is not a dependable bloomer. When grown in a semi-arid location, it produces scant foliage and 2-flowered scapes, but may skip some seasons. When grown with normal summer watering, it produces abundant leaves and the umbels may be 2—3—4—5-flowered. After a few years it makes a large clump with many long leaves and flowering declines to a few flowering umbels. Thus, it is an unsatisfactory plant unless one can work out a culture which discourages rapid formation of offsets. Some have suggested planting deeply but the writer has not experimented with this procedure.

Chlidanthus boliviensis is a plant from the semi-arid mountains in Bolivia and gradually declines under ordinary garden culture, and finally dies. However, before it died, the writer crossed it with *Chlidanthus fragrans* and obtained a very vigorous hybrid intermediate between the two species. This hybrid can be grown under ordinary garden culture and blooms each season without forming large clumps. It solves the problem for those who wish to have a fragrant *Chlidanthus* in their garden. It sets some seeds when hand pollinated so that rapid increase can be obtained.

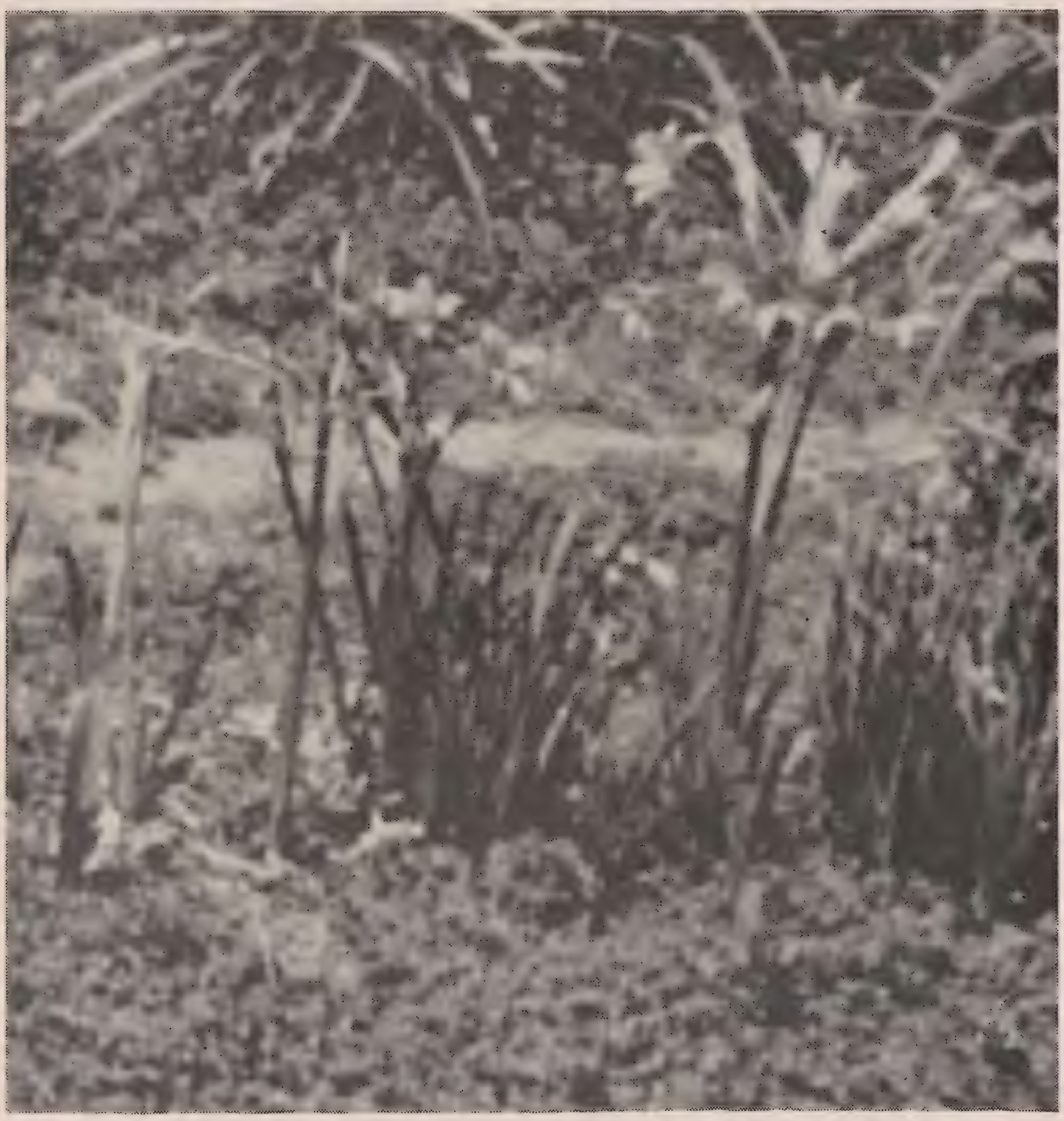

Fig. 29. **Chlidanthus x traubii** Moldenke as flowered at La Jolla, Calif., 1966.

HYMENOCALLIS VELARDEI

Hymenocallis velardei blooms each season in the garden (July), sometimes again in the late fall or winter. As the illustration (Fig. 30) shows, it is not a brilliant success as a flowering plant, but it should be useful in making additional hybrids with *Hymenocallis narcissiflora* and *H. amancaes* or even other *Hymenocallis* species. Such hybrids should be fine companions to the well-known *Hymenocallis* x *festalis* Worsley (1905).

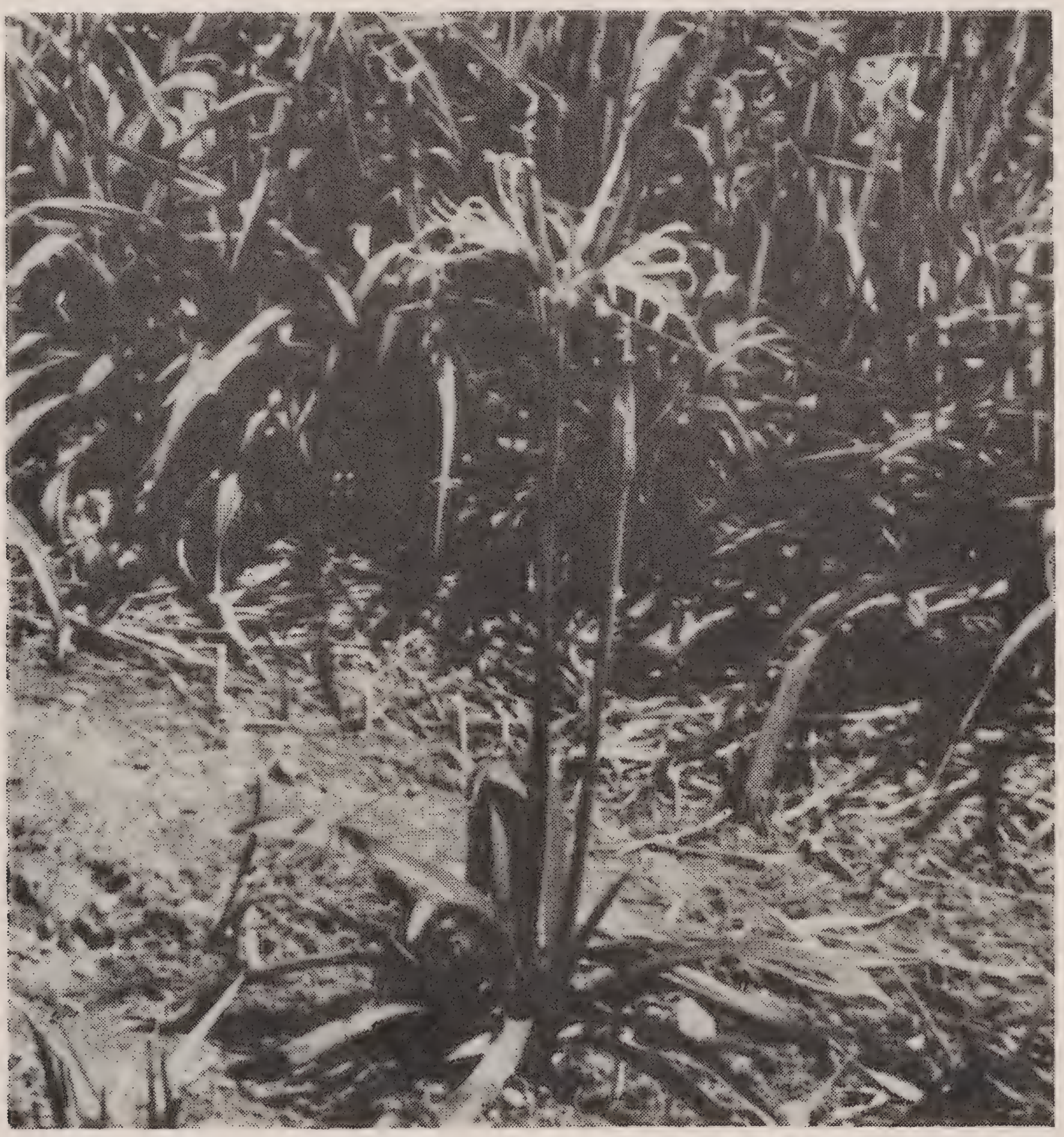

Fig. 30. **Hymenocallis velardei** Traub, as flowered at La Jolla, Calif., July 2, 1966.

EARLY FORM OF BRUNSVIGIA X PARKERI

A few years ago, Mr. William Morris of Australia kindly sent a large bulb of an amaryllid resembling *Brunsvigia josephinae*, but with somewhat larger flowers. He asked that it be identified. When it flowered in 1965 and again in 1966 (fig. 31) it was at once evident that it represented an early form of *Brunsvigia* x *parkeri* which was illustrated in a past issue of Plant Life (see Traub & Hannibal, Plant Life 16: 39-62. 1960). The color of the flower is a beautiful deep pink and the presence of fragrance proves that *Brunsvigia rosea*, the Cape Belladonna is one of its ancestors. This is a beautiful addition to any garden with a Mediterranean type of climate. It has to be kept relatively dry, with only occasional watering during the summer, and copious watering during the growing season in winter.

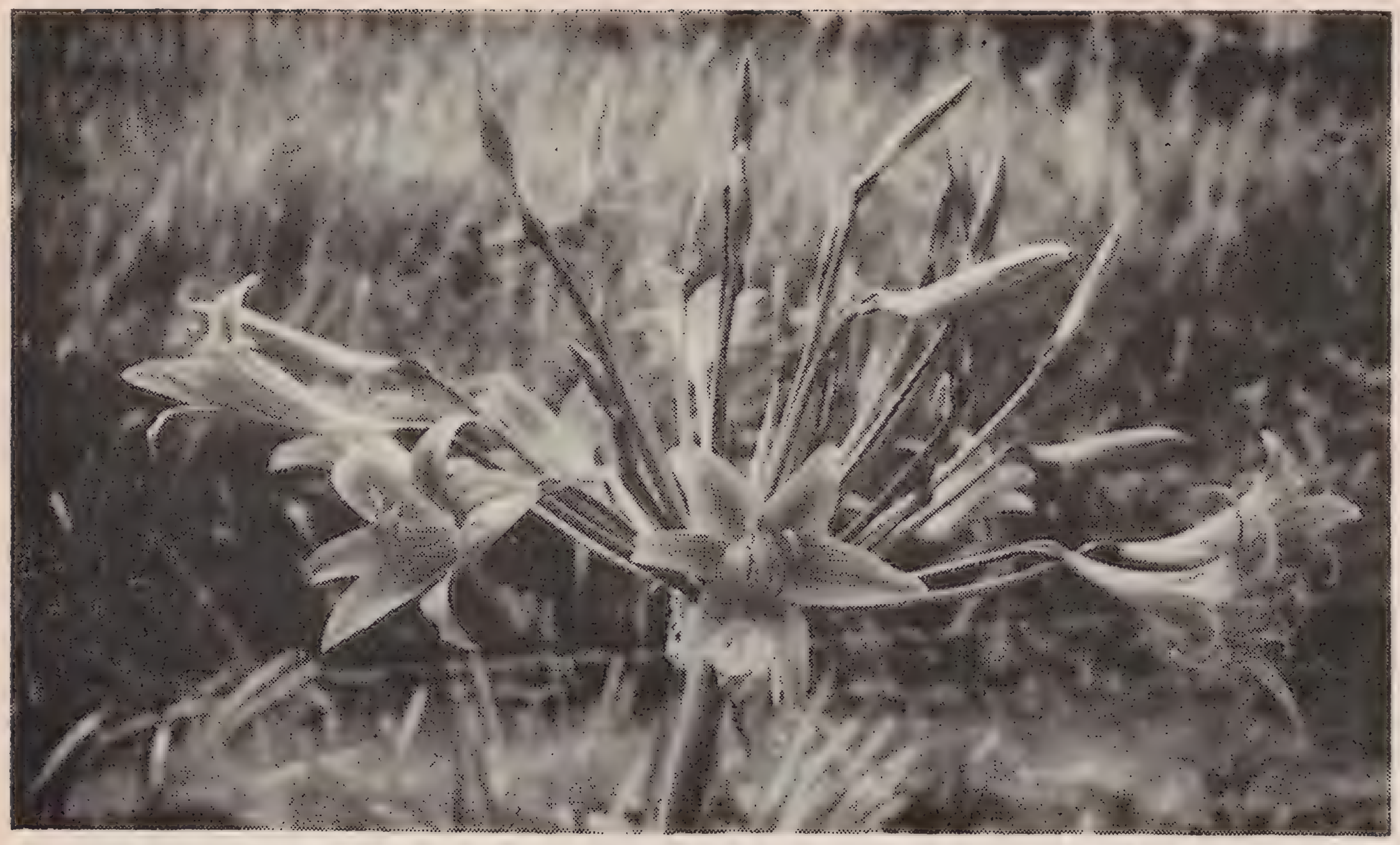

Fig. 31. **Brunsvigia x parkeri**, one of the original hybrids between **Brunsvigia rosea** and either **B. josephinae** or **B. grandiflora.** Its hybrid nature is given away by the fragrance inherited from **B. rosea.** Photo by Mrs. Marjorie Anthes.

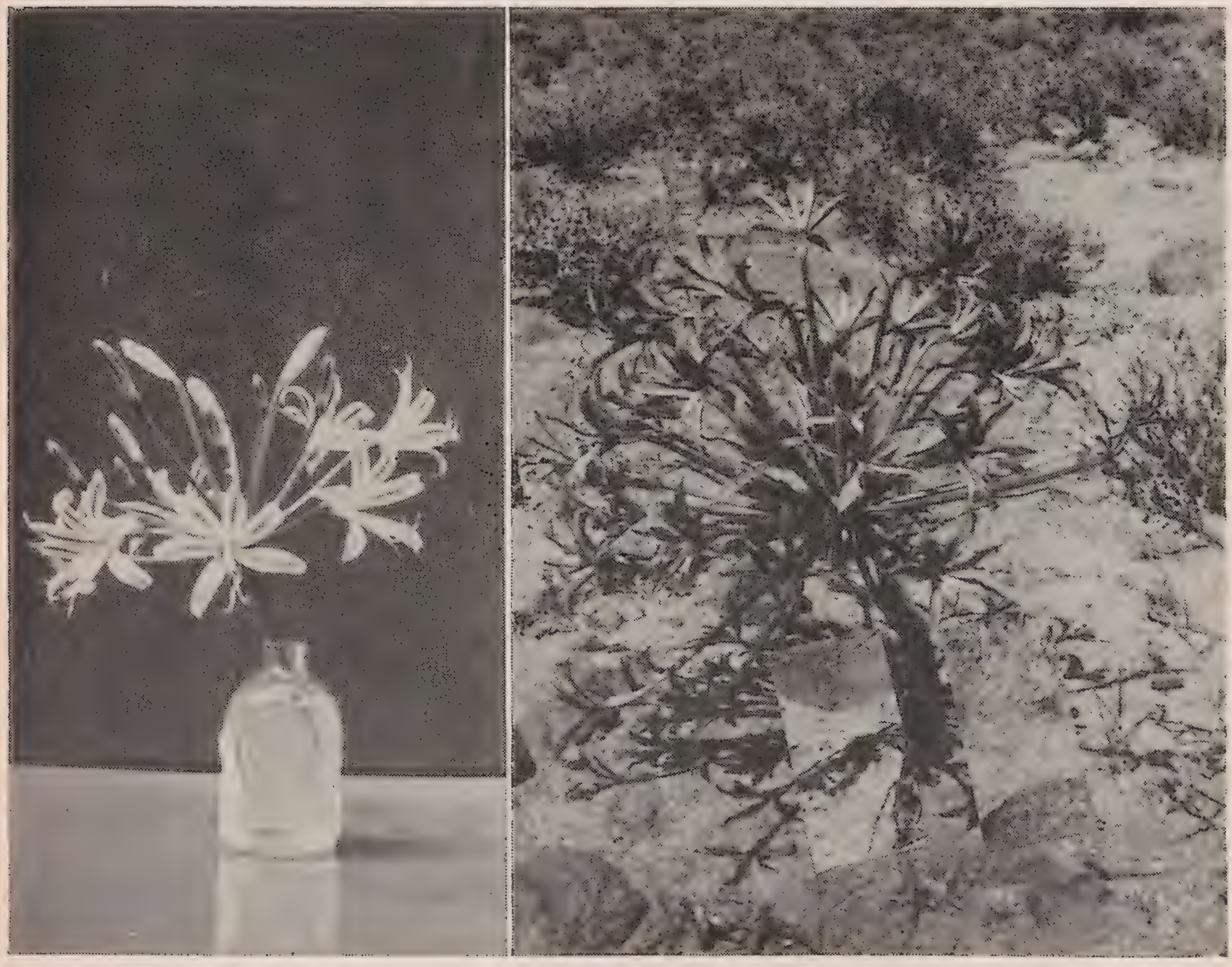

Fig. 32. **Left, Brunsvigia grandiflora,** from Eastern Cape Province; and **right, Brunsvigia radulosa,** from central (Great) Karoo of Cape Province. Photos by Leon Boshoff-Mostert.

BRUNSVIGIAS IN THEIR NATIVE HABITAT

The following subjects did not flower in the writer's garden, but represent illustrations (Fig. 32) sent in by Mr. Leon Boshoff-Mostert who observed them in their native habitat in South Africa. At the left is shown *Brunsvigia grandiflora,* with umbels up to 30-flowered. It is native to the Eastern Cape Province from Uitenhange and Alexandria Division eastward to Natal. At the right is shown *Brunsvigia radulosa* which is native to Bechuanaland, the central (Great) Karoo of Cape Province, Orange Free State, Lesotho, Natal and Transvaal.

ON THE KARYOLOGY AND PHYLOGENY OF TULBAGHIA

Roux Wilsenach, *Dept. of Botany, University of the Witwatersrand, Johannesburg, South Africa*

According to previous reports (Whitaker and Flory, 1955; Riley and Hoff, 1958; Mookerjea, 1955; Sharma, 1956; Flory, 1955 and Smith and Flory, 1965,) the basic chromosome number of *Tulbaghia* is 6, but both diploid and tetraploid forms have been reported. In the present report 6 was again found to be the basic chromosome number, but greater variation was recorded.

Tulbaghia and *Agapanthus* are commonly grouped in one tribe, but Traub (1963) separated them completely, grouping *Tulbaghia* with genera like *Allium* in the tribe *Allieae.* In the present study some suggestions are made on the phylogeny of this genus.

MATERIAL AND METHOD

Most samples were collected in their natural habitat, their root tips were fixed in Craf for at least 12 hours and subsequently transferred to 70% alcohol, followed by dehydration and paraffin wax embedding. Sections of root tips were 14-20 microns thick.

Sections were stained in a 1% aqueous solution of Crystal Violet, following the method of Smith (1934). Drawings were made with the aid of a netmicrometer in the eyepiece.

RESULTS

The longest chromosome pair is often over 20 microns in length and the shortest over 10 microns. It is often difficult to identify the different chromosome pairs (see eg. Chromosomes B, C, D and E of *T. alliacea*).

In the idiograms the chromosomes are generally arranged from the longest to the shortest, but exceptions occur (eg. chromosome C is occasionally longer than chromosome D) in order to facilitate comparison of the idiograms of the different species.

1. *Tulbaghia alliacea* L. f. . . . $2n=12$ (collected in Peddie district, Cape Province). This species has a very symmetric karyotype, there is

little variation in length of the chromosomes and all the pairs have sub-median centromers. No secondary constrictions could be identified; see Fig. 33 (1) and Fig. 35 (13).

2. *Tulbaghia ludwigiana* Harv. Cultivated. *2n=12.* The karyotype of this species is very similar to that of *T. alliacea* as described above. Occasionally tetroploid cells are noticed amongst the normal diploid cells in the root tips. These tetraploid cells are bigger than the adjoining diploid cells; see Fig. 33 (2, 3) and Fig. 35 (14).

3. *Tulbaghia violacea.* Baker *2n=12* (Collected in the Alice district, Cape Province). Chromosomes A, B and D have sub-median centromeres whereas chromosome C has a proximal arm less than a third of the length of the distal arm (sub-terminal centromere), chromosome E has a median centromere and chromosome F has a secondary constriction in addition to the sub-median centromere; see Fig. 33 (4) and Fig. 35 (15).

4. *Tulbaghia galpinii.* Schltr. *2n=12* (Collected in the Alice district, Cape Province). This idiogram is very similar to that of *T. violacea* as described above, but chromosome C has a much longer proximal arm and chromosome F has no secondary constriction and a very short proximal arm; see Fig. 33 (5) and Fig. 35 (16).

5. *Tulbaghia fragrans,* Verdoorn. *2n=12.* This species was collected at three places: Cultivated in Pretoria, cultivated in Johannesburg, and in its natural habitat at the Letatsa river. The idiograms were practically identical.

Three chromosomes (A, B and F) have median centromeres and the other three have sub-median centromeres. No secondary constrictions could be identified.

In one root tip of the plant cultivated in Pretoria all the dividing nuclei showed 13 chromosomes. Two chromosomes (or chromosome derivatives) were much shorter than the others (labelled fr. 1 and fr. 2 in Fig. 33 (7)).

In one of these a centromere could be identified, but not in the other. The most apparent explanation of this phenomenon is that one of the long chromosomes (perhaps chromosome A) fragmented close to the centromere. Riley and Hoff (1958) recorded such an occurrence in *T. violacea* also. This would mean that the one fragment was without a centromere and one would expect such a fragment to become lost from some nuclei, but this was not the case in this root tip. Lima-de-Faria (1955) has demonstrated in rye that such a fragment with a deleted centromere can be capable of movement at anaphase and it will then divide regularly. This seems to be the explanation also in the anomalous root tip here observed; see Fig. 33 (6, 7) and Fig. 35 (17).

6. *Tulbaghia leucantha,* Baker. *2n=12.* From Alberton district, Transvaal.

The idiogram of this species is very similar to that of *T. violacea* as described above, but no secondary constrictions could be observed; see Fig. 33 (8) and Fig. 35 (18).

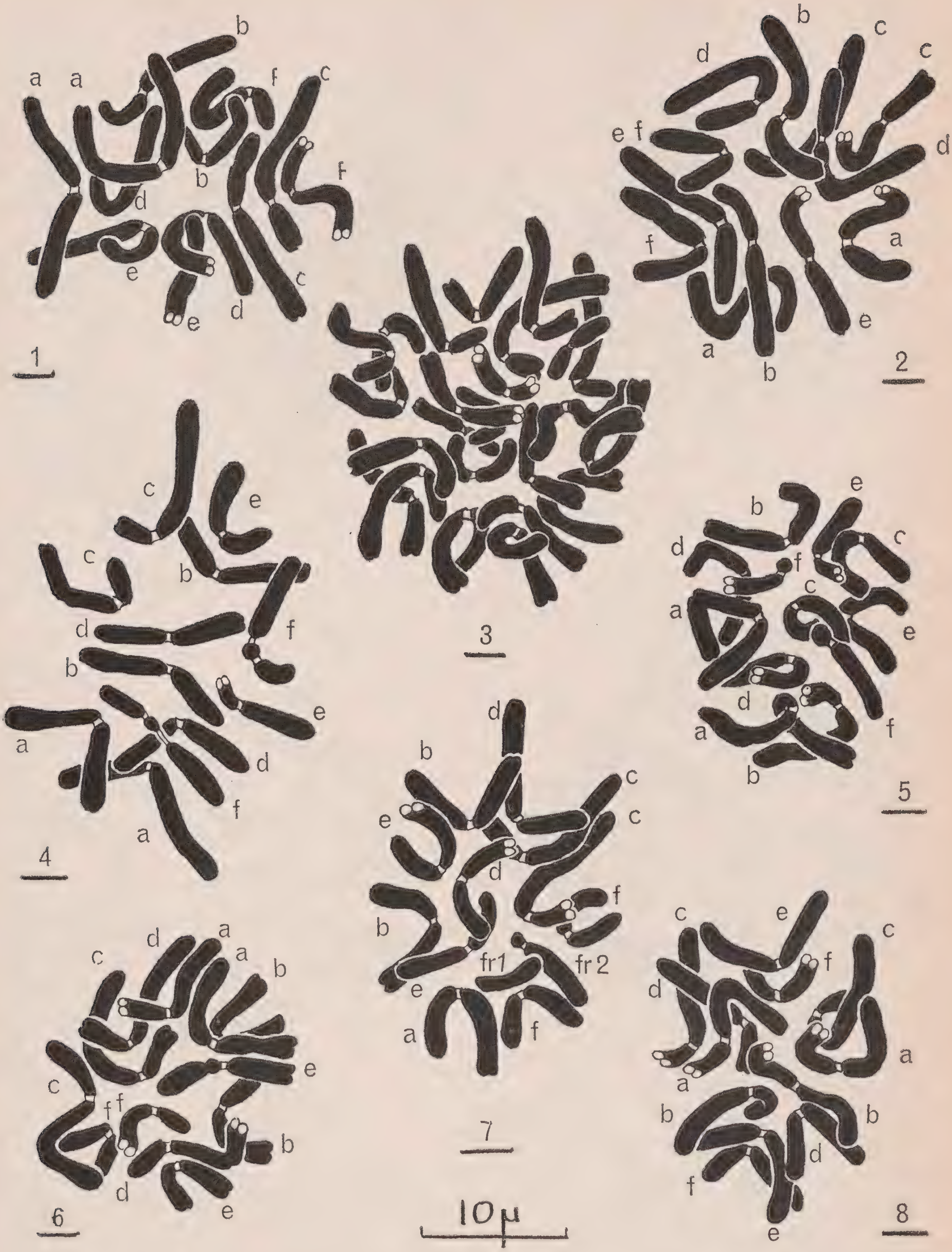

Fig. 33. **Tulbaghia** chromosomes: **1.: Tulbaghia alliacea** 2n=12; **2.: T. ludwigiana** 2n=12; **3.: T. ludwigiana,** an occasional tetraploid cell; **4.: T. violacea,** 2n=12; **5.: T. galpinii** 2n=12; **6.: T. fragrans** 2n=12 (from Letaba); **7.: T. fragrans** (cultivated), showing two fragments **fr. 1** and **fr. 2; 8.: T. leucantha** 2n=12.

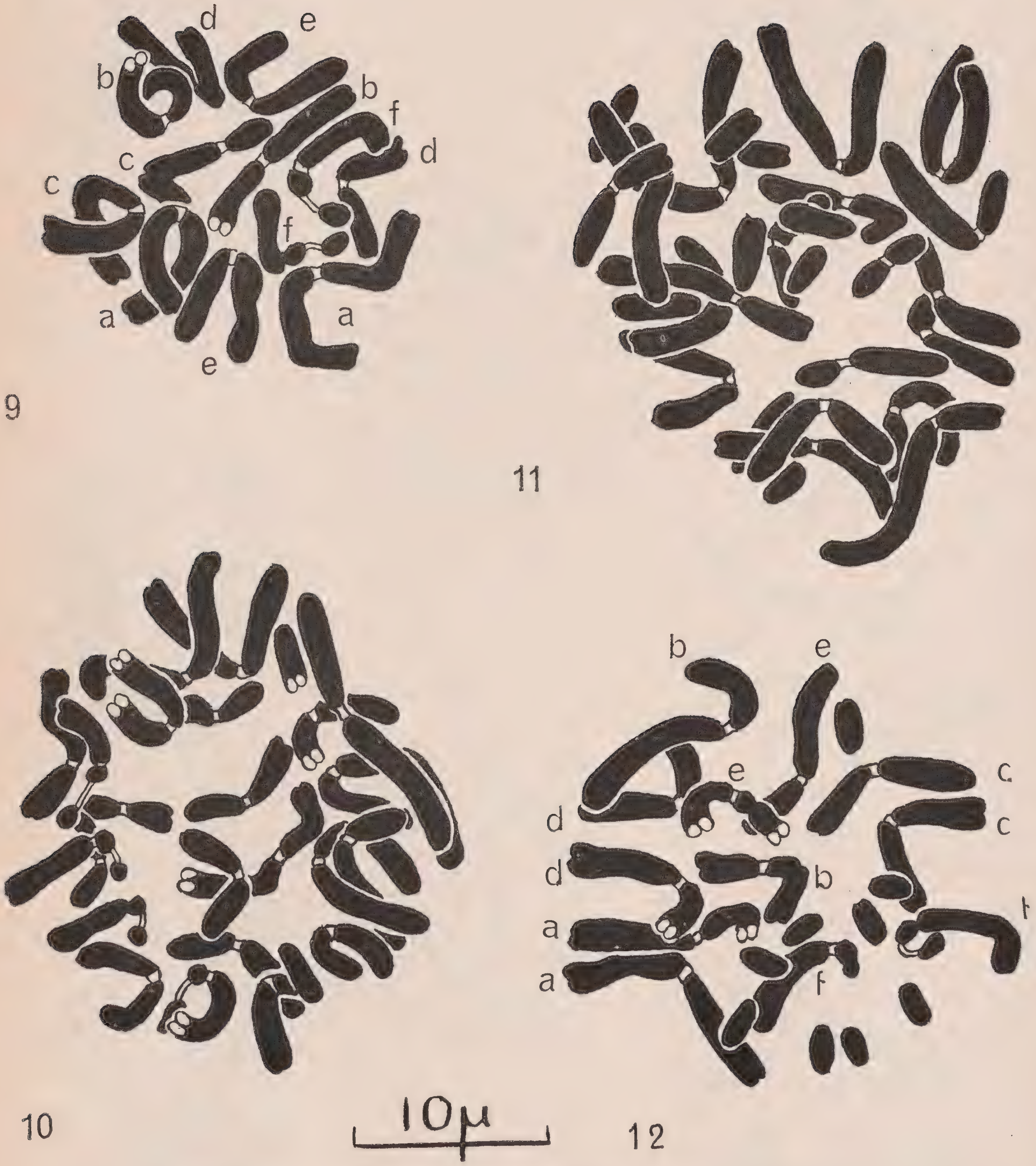

Fig. 34. **Tulbaghia** chromosomes: **9.: Tulbaghia** species collected at Linmeyer, 2n=12; **10.:** same species, showing tetraploid cell in tetraploid root of a diploid plant; **11.: Tulbaghia** species collected at Nelspruit, 2n=28, interpreted as a tetraploid with 4 extra chromosome derivatives or B chromosomes; **12.: Tulbaghia** species collected at Hammanskraal, 2n=12, but in addition to these there are 9 B chromosomes.

7. *Tulbaghia* species collected at Linmeyer, Transvaal. *2n=12* Chromosomes A, B and E have median centromeres, the others have sub-median centromeres. Chromosome F had a very pronounced secondary constriction in the proximal arm. This constriction is often so pronounced that the satellite is connected to the rest of the chromosome by rather long slender thread.

On a diploid plant one root was found in which all the cells were tetraploid; see Fig. 34 (9, 10) and Fig. 35 (19).

8. *Tulbaghia* species collected at Nelspruit, Transvaal. *2n=28.*

No idiogram could be prepared because the chromosome complex is very difficult to analyse. In contrast to most of the other species investigated some (±8) chromosomes were very much shorter than the rest.

At telophase four nucleoli were formed in the nuclei; see Fig. 34 (11).

9. *Tulbaghia* species collected at Hammanskraal. *2n=12+8 or 9 B chromosomes.*

The idiogram of this species is quite similar to that of the Linmeyer specimens, but in addition to the normal 12 chromosomes there were usually 9 (occasionally 8) much smaller chromosomes. The centromeres could not be identified with any certainty in these small chromosomes.

These chromosomes have been interpreted as B chromosomes, because they were much smaller than the others and because they occur in both odd and even numbers (Darlington, 1956). Their behaviour was not studied at meiosis to determine whether they paired or not with the A's (according to Darlington B chromosomes don't pair with A's at meiosis), with the result that their description as B chromosomes must be considered as a tentative one only; see Fig. 34 (12) and Fig. 35 (20).

DISCUSSION

The genus *Tulbaghia* is in need of revision. Some species are well defined, but it is often difficult to identify plants. The species *T. leucantha,* for example, differs from *T. acutiloba* mainly in the colour of the perianth which is white in *leucantha* and green in *acutiloba.* In one community near Alberton all the possible variations in perianth colour were found. These plants were tentatively named "*T. leucantha*".

The idiograms of *T. violacea, T. fragrans, T. leucantha, Tulbaghia* from Linmeyer, *T. alliacea* and *T. ludwigiana* were remarkably similar and all have 12 somatic chromosomes. Only minor structural chromosomal changes could have been involved in speciation in these plants.

Polyploid cells have been found in normal plants by Mookerjea (1955), and by the present author in *Tulbaghia ludwigiana.* In the plants collected at Linmeyer one tetraploid root was found. The *Tulbaghia* collected at Nelspruit was a tetroploid, but there are apparently also four fragments or B chromosomes in this complex.

Smith and Flory (1965) reported for *T. leucantha* from South Africa 12 as the diploid number and 24 for plants of the same species collected in Rhodesia. In the plants collected in South Africa in the present study 12 was also reported as the diploid number.

For *T. ludwigiana* Smith and Flory (1965) reported 2n=24 as the chromosome number. They suggested the possibility that *T. ludwigiana* has been derived from *T. alliacea,* but they mention also the possibility that the plant could have arisen by allopolyploidy. In the present study 2n=12, has been reported for *T. ludwigiana,* but occasional tetraploid cells were also recorded. *T. ludwigiana* must therefore also be considered as a species with two levels of ploidy as was reported for *T. leucantha* by Smith and Flory (1965).

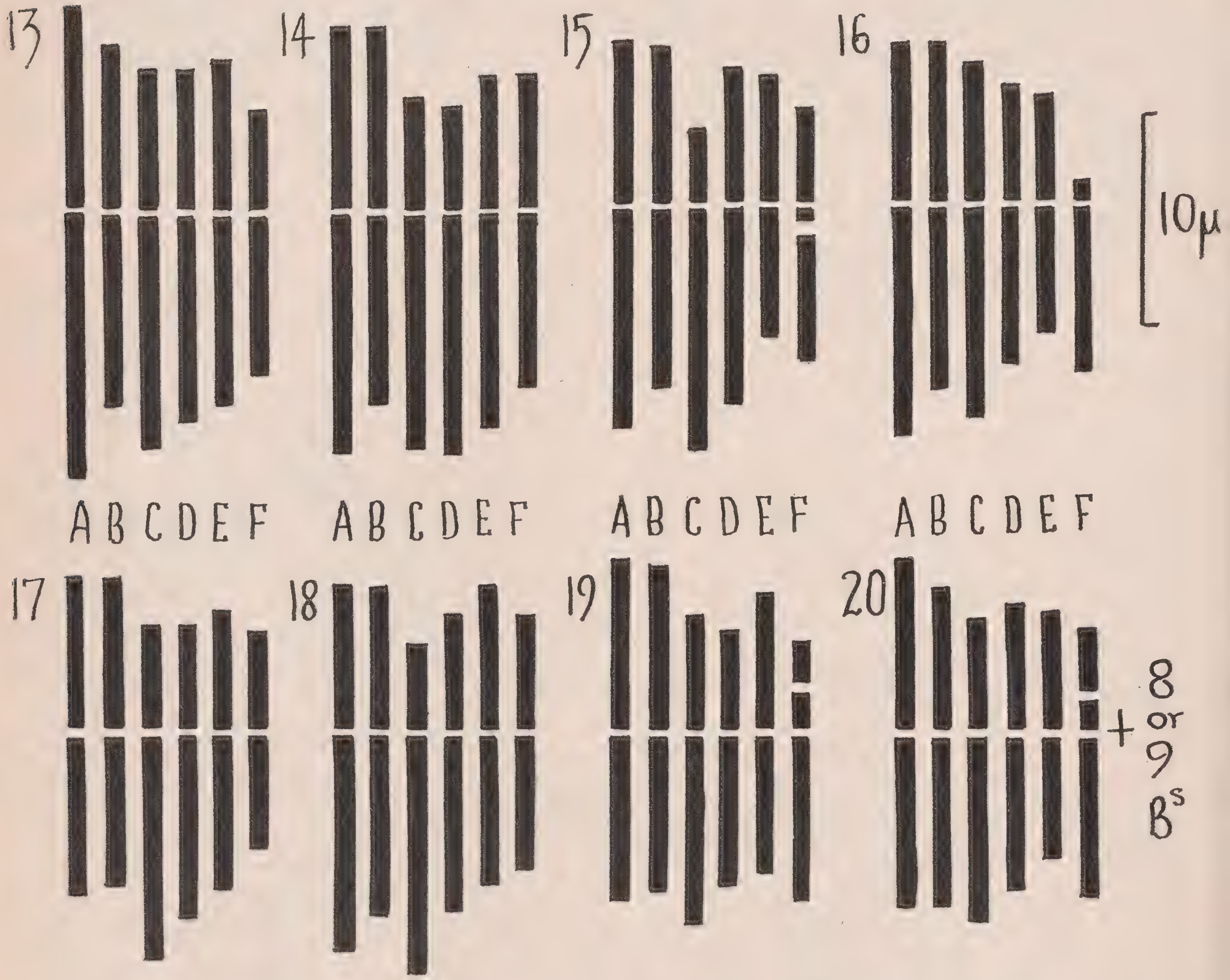

Fig. 35. Idiograms for the species: **13.: Tulbaghia alliacae; 14.: T. ludwigiana; 15.: T. violacea; 16.: T. galpinii; 17.: T. fragrans; 18.: T. leucantha; 19.: T.** species (Linmeyer); **20.: T.** species (Hannanskraal).

Polyploidy thus occurs in: (a) isolated cells of one plant; (b) in whole roots of some plants; (c) in some communities of some species; (d) some species appear to be polyploid (eg. the species from Nelspruit).

Smith and Flory (1965) did remark on the presence of SAT chromosomes in *Tulbaghia* and their absence in the genus *Agapanthus.* This must not be considered as an important difference, because no secondary constrictions could be observed by the present author in six of the taxa here investigated, whereas they were most conspicuous in other species of the same genus.

Smith and Flory (1965) found two sec. constrictions in *T. alliacea* (one of which was very conspicuous) but the present author could not observe any in this species. These differences must be due to the fact that the secondary constrictions are often very inconspicuous and that these inconspicuous secondary constrictions may become clear in some pretreatments and different fixations. *T. fragrans,* for example, has no apparent secondary constriction when fixed in Craf, but the present author has often used this as class material for students (fixing in Carnoy) and it is then occasionally possible to see a secondary constriction in the typical position for this genus is very close to the centromere in the proximal arm. The absence of secondary constrictions can therefore only be assumed after various fixatives and pretreatments were tried.

B chromosomes and/or fragments were also recorded in the present study, and in one case this was also recorded in a polyploid. Variation in the basic chromosome number in this genus, may be due to this phenomenon, but this aspect will involve a detailed study. In plants of *T. acutiloba* the present author found 14 somatic chromosomes, but because it was impossible this far to find out whether the extra two were mere fragments or extra chromosomes the result was not reported in detail in this account.

ON THE PHYLOGENY OF TULBAGHIA

Hutchinson (1934) and Pax and Hoffman (1930) grouped *Tulbaghia* and *Agapanthus* in one tribe. Mookerjea (1955) saw no karyological evidence against grouping them together and although Smith and Flory (1965) did not commit themselves, they pointed out that karyological and morphological differences are present between the two genera.

Traub (1963) has separated them completely, bringing *Tulbaghia* much closer (in fact in the same tribe) with *Allium*. The present author is in agreement with Traub (1963) that *Tulbaghia* and *Agapanthus* should not be considered as closely related, because of: (a) chromosome size differences; (b) differences in basic number; (c) the presence of a corona in *Tulbaghia*.

In a description of *Cryptostephanus vansonii* Verdoorn (1943) remarked that she had to consider both the genera *Tulbaghia* and *Clivia* (*Tulbaghia* because of the presence of a corona, and *Clivia* because of its remarkable vegetative resemblance to this plant.) It is therefore not unreasonable to suggest that *Cryptostephanus* occupies an intermediate position between *Tulbaghia* and *Clivia*. Gouws (1949) included *Cryptostephanus* and *Clivia* in one tribe on karyological data, and so did Traub (1963). The suggestion that *Tulbaghia* may be more closely related to *Cryptostephanus* is however a new one.

Cryptostephanus has 24 chromosomes and when the idiogram of Gouws is studied a striking feature is noticel: the "haploid" set can be arranged into six pairs, four of which are almost identical. It thus seems possible that *Cryptostephanus* could have evolved from a 2n=12 ancestor by polyploidy. A possible relationship between the *Tulbaghia* and *Cryptostephanus* can be shown as in Fig. 36 (Diagram 1).

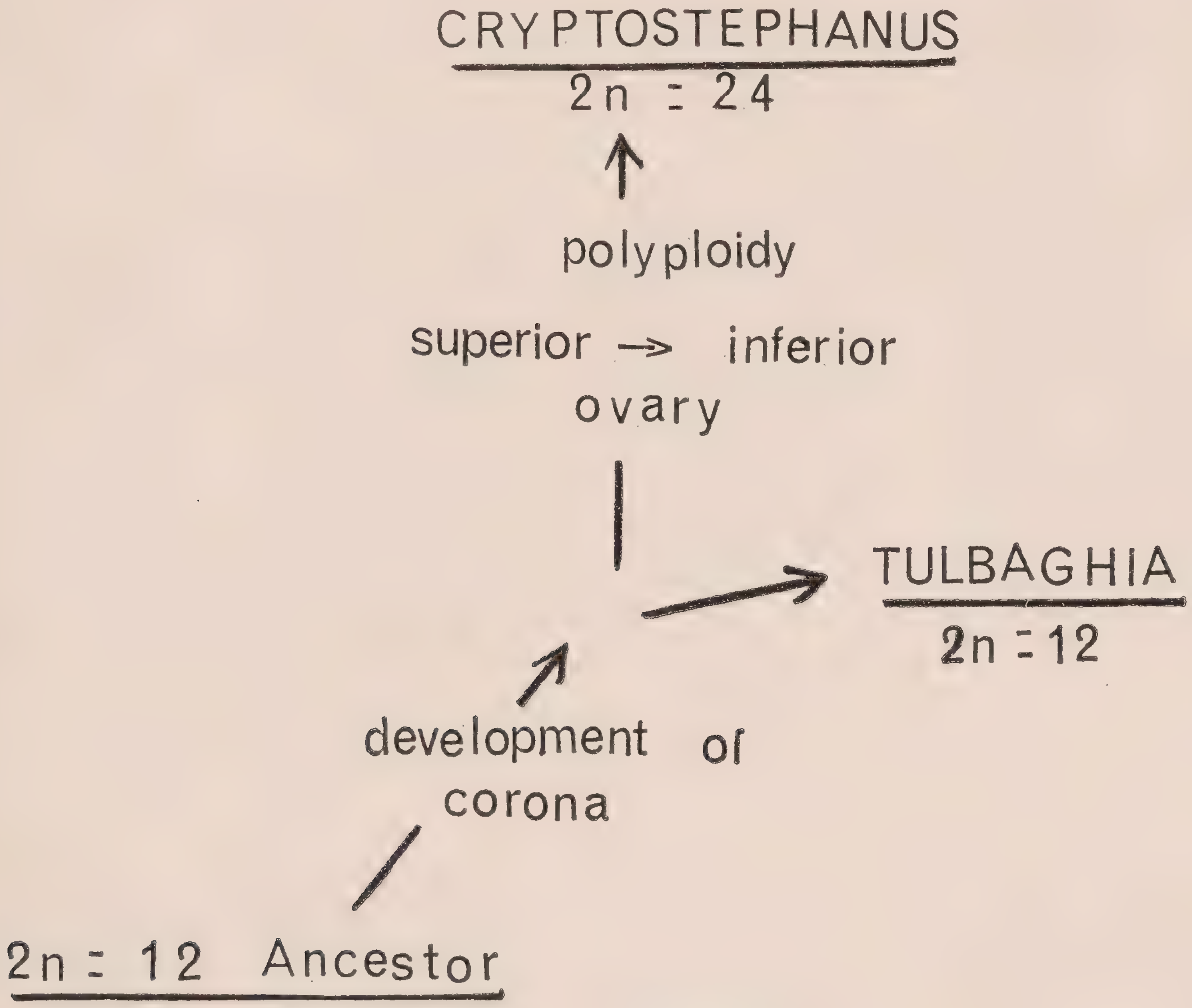

Fig. 36. Diagram 1.

SUMMARY

Twelve has been reported as the diploid chromosome number for eight taxa of *Tulbaghia* in this study, and this supports previous reports so that 6 can be assumed to be the basic chromosome number.

Polyploidy occurs quite commonly in this genus and can be seen in: (a) a few cells only; (b) in some roots of diploid plants; (c) in some individuals or communities; (d) in some species.

Fragments without centromeres have been recorded, and these apparently can move at anaphase.

B chromosomes have been recorded in some taxa. It was suggested that *Tulbaghia* and *Agapanthus* should not be included in the same tribe, and a hypothesis that *Tulbaghia* may be linked to *Cryptostephanus* by a common ancestry was offered.

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REGISTRATION OF NEW AMARYLLID CLONES

Mr. W. D. Morton, Jr., *Emeritus Registrar*

Mr. Edward F. Authement, *Registrar*

Mrs. Emma D. Menninger, *Associate Registrar*

This department has been included since 1934 to provide a place for the registration of names of cultivated *Amaryllis* and other amaryllids on an International basis. The procedure is in harmony with the INTERNATIONAL CODE OF BOTANICAL NOMENCLATURE (edition publ. 1961) and the INTERNATIONAL CODE OF NOMENCLATURE FOR CULTIVATED PLANTS (edition publ. 1958). Catalogs of registered names, as well as unregistered validly published names, will be published from time to time as the need arises. The first one, "DESCRIPTIVE CATALOG OF HEMEROCALLIS CLONES. 1893-1948" by Norton, Stuntz and Ballard was published in 1949. This may be obtained at $2.50 prepaid from: Dr. Thos. W. Whitaker, Executive Secy., THE AMERICAN PLANT LIFE SOCIETY, Box 150, La Jolla, Calif. CATALOG OF HYBRID NERINE CLONES, 1882-1958, by Emma D. Menninger; and CATALOG OF BRUNSVIGIA CULTIVARS, 1837-1959, by Hamilton P. Traub and L. S. Hannibal, were published in 1960 Plant Life, with additions to both in Plant Life 1961. In Plant Life 1961, the first edition of THE GENUS X CRINODONNA was published which serves also as a catalog of cultivars. In Plant Life 1964, the first edition of "CATALOG OF HYBRID AMARYLLIS CULTIVARS, 1799 to Dec. 31, 1963" was published. Other catalogs of cultivated amaryllids are scheduled for publication in future issues.

Only registered named clones of Amaryllis and other amaryllids are eligible for awards and honors of the AMERICAN AMARYLLIS SOCIETY at Official Amaryllis Shows.

Correspondence regarding registration of all amaryllids such as *Amaryllis, Lycoris, Brunsvigia, Clivia, Crinum, Hymenocallis,* and so on should be addressed to Mr. Edward F. Authement, *Registrar,* 2214 Gallier St., New Orleans, Louisiana 70117. The registration fee is $2.00 for each clone to be registered. Make checks payable to AMERICAN PLANT LIFE SOCIETY.

NEW AMARYLLIS BREEDERS 1966

Abbrev.
Beck., E. M.—Mr. E. M. Beckham, 1452 Glenmore Ave., Baton Rouge, La.
Rob.—J. J. Robertson, 8218 Nelson St., New Orleans, La.
Pahls—Lydia C. Pahls, 3035 S.W. 15th St., Miami, Fla.
Schmidt—J. T. Schmidt, Rt. 1, Box 48, Prairieville, La.

AMARYLLIS CLONES REGISTERED IN 1966

EDWARD F. AUTHEMENT, *Registrar*

Registered by Mrs. Lydia C. Pahls, 3035 S.W. 15th St., Miami, Fla.

'Frank Pahls' (Pahls—1965), R; A-843, D-7; U-2fld; 17″h; fls.7″ diam; solid red, light streaks in throat; spr.

Registered by Mr. E. M. Beckham, 1452 Glenmore Ave., Baton Rouge, La.

'Salmon Halo' (Beck., E. M.—1966), R; A-844, D-5A; U-4fld; 23½″h; fls.7″ diam; jasper red (HCC-018/1), greenish throat blending to white midirbs, picotee edged; spr.

'Midget' (Beck., E. M.—1966), R; A-845, D-8; U-6fld; 15-16″h; fls. 3-3½″ diam; turkey red (HCC-721), slight whitish midrib halfway up segs.

Registered by J. J. Robertson, 8218 Nelson St., New Orleans, La.

'Maxine' (Rob.—1966), R; A-846, D-5A; U-4fld; 19″h; fls.7″ diam; blood red (HCC-820/1), glossy throat, greenish midrib on setsegs only.

Registered by Mr. Frederick B. Schmitz, Rt. 1 Box 438, Port Sulphur, La.

'Phoebe' (Schm.—1966), R; A-847, D-5A; U-3-4fld; 15″h; fls.7″ diam; vermilion (HCC-18/1) with pale green throat blending to white, minute vermilion spots each side of midribs; spr.

Registered by Ludwig & Co., Hillegom, Holland.

'Indian Orange' (Lud.—1966), R; A-848, D-5A; U-4fld; 28-30″h; Fls. 9″ diam; indian orange with a suggestion of azalea pink in middle of the petals; spr; de.

'Red Flag' (Lud.—1966), R; A-849, D-5B; U-4fld; 25-27″h; fls.8″ diam; orient red (HCC-819); spr.

'Red Lining' (Lud.—1966), R; A-850, D-5B; U-4fld; 24-26″h; fls.8″ diam; pure white, red edged, petsegs slightly red speckled; spr; de.

'Red Man' (Lud.—1966), R; A-851, D-8; U-5-7fld; 20″h; 5-6″ diam; scarlet, with slight darker throat; spr; de.

'The Alamo' (Lud.—1966), R; A-852, D-5A; U-4fld; 26-28″h; fls.8″ diam.: blood red with darker glossy throat; spr; de.

'Twinkling Star' (Lud.—1966), R; A-853, D-8; U-4-5fld; 20-22″h; fls.5-6″ diam; white, picotee edged; spr; de.

Registered by Mr. J. T. Schmidt, Rt. 1, Box 48, Prairieville, La.

'Manchac Peach' (Schmidt—1966), R; A-854, D-5B; U-4fld; 19"h; fls.7" diam; peach pink to salmon pink, white midrib in two lower setsegs, white midrib bordered red in two upper setsegs; spr; de.

NEW HYBRID CYRTANTHUS CLONES

Registered by Aleck Korsakoff, 7634 Oriole St., Jacksonville, Fla. 32208

Cyrtanthus x *henryae* clone *'Meta'*. Named in honor of his wife. The flower color is fire red (HCC 15/2) outside of the tube, and brick red (HCC 16/2) inside the flare of the tepalsegs; scape about 10 inches long, pedicels 1¼ inches long.

Cyrtanthus x *henryae* clone *'Tanurochka'*. Named in memory of a childhood friend. The flower is porcelain rose (HCC 620) outside of the tube, and Delft rose (HCC 020/2) inside the flare of the tepalsegs, about ⅝-inch across the apex of the flower; scapes about 13 inches tall.

EUCHARIS KORSAKOFFII SP. NOV.

HAMILTON P. TRAUB

In 1965, Mr. Lee Moore, of P. O. Box 504, Kendall, Florida and Casilla 498, Iquitos, Peru, the plant explorer, collected an amaryllid

Fig. 37. Lee Moore on expedition on which **Eucharis korsakoffii** was found at the Hierra Waterfalls, about 40 km. from the City of Moyobamba, Dept. of San Martin, Peru.

which turned out to be new to science. He has requested that it be named in honor of Mr. Aleck Korsakoff of Jacksonville, Florida.

The plant was found at an altitude of 1500 meters in deep shade at the base and sides of the banks by the waterfalls named Hierra, about 40 km. by foot from the city of Moyobamba in the Department of San Martin, Peru. (see Figs. 37 and 38). The bulbs were found growing in peaty soil or leaf mold in soft areas with good drainage usually between cracks in large rock formations on sides of cliffs.

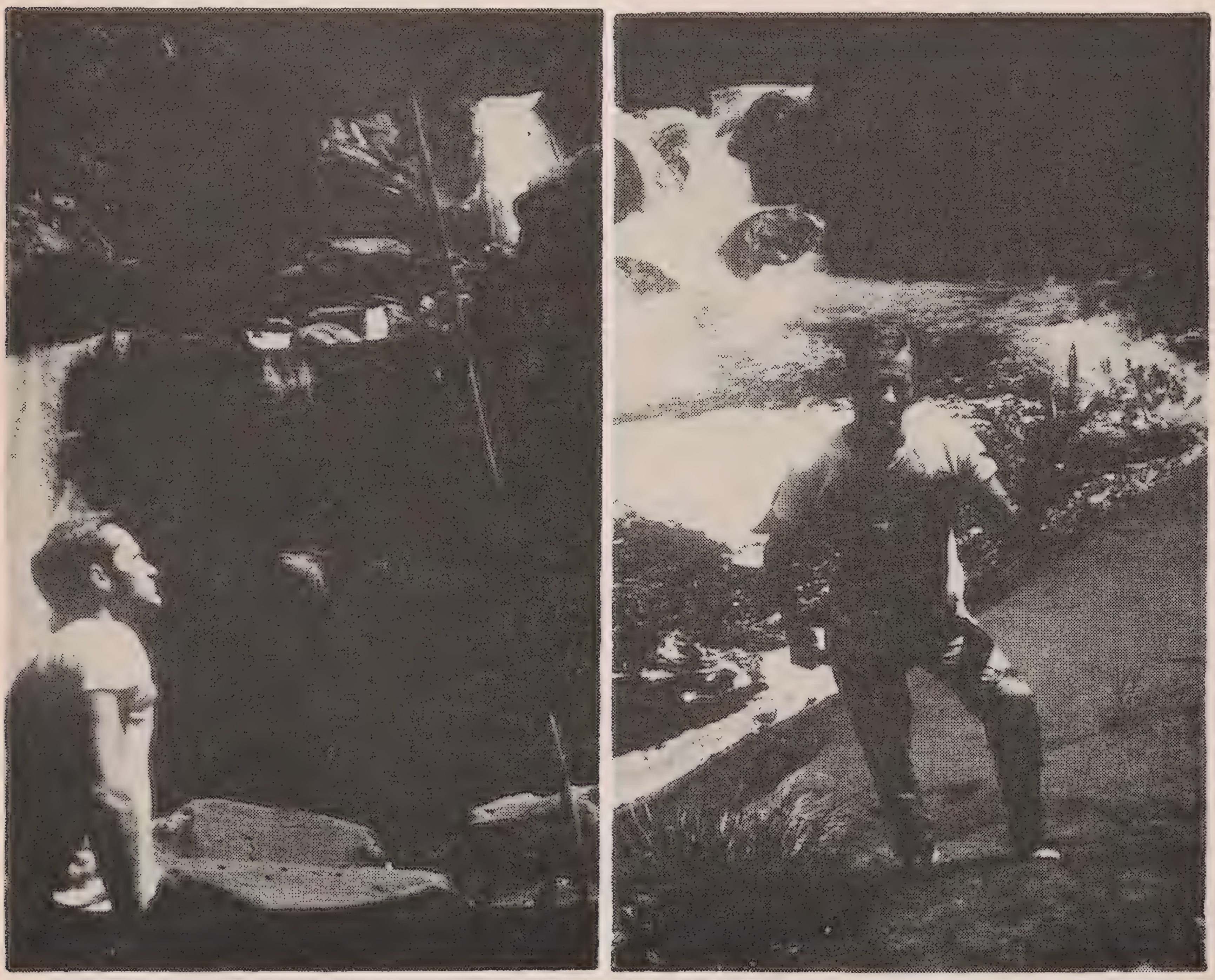

Fig. 38. **Left,** Hierra Waterfalls, where **Eucharis korsakoffii** was found by Lee Moore; **right,** Handful of the new species held by Lee Moore, after they were pulled from crevices in the rocks, about 40 km. from the City of Moyobamba, Peru.

Mr. Moore sent the bulbs to Mr. Aleck Korsakoff at Jacksonville, Florida, and to Mr. J. N. Giridlian, at Arcadia, California. Mr. Giridlian flowered it and sent a living specimen in flower to the writer. This was mounted as the holonomenifer (name bearer) specimen. The species has been named in honor of Mr. Aleck Korsakoff, the well-known plant enthusiast.

Eucharis korsakoffii Traub, **sp. nov.** Amaryllidac.

A E. fosteri laminis foliorum latioribus, per umbella plus floribus, pedicellis longioribus, et tubo tepalorum breviore praecipue recedit. Habitat in Peruvia.

Bulb globose, 3 cm. long, 3.2 cm. in diam. *Leaves* petiolate, thick in texture, petioles slender, 5—10—15 cm. long; blades elliptic, 11—12—14.5—17.5 cm. long; 3.5—4—4.4—5 cm. wide, thick in texture. *Scape* up to 28 cm. long, slender. *Spathe* lanceolate, 2.5 cm. long. *Umbel* 11-flowered; flowers pure white. *Pedicels* slender, 4.4—4.6—5 cm. long at anthesis. *Ovary* 5 mm. long, 4 mm. in diam.; ovules about 3 per locule. *Tepaltube* 6 mm. long. *Tepalsegs* oblong, 1.8 cm. long, 6—8 mm. wide. *Stamens* 1.1 cm. long; anthers 4 mm. long. *Style* 2 cm. long, stigma trifid.

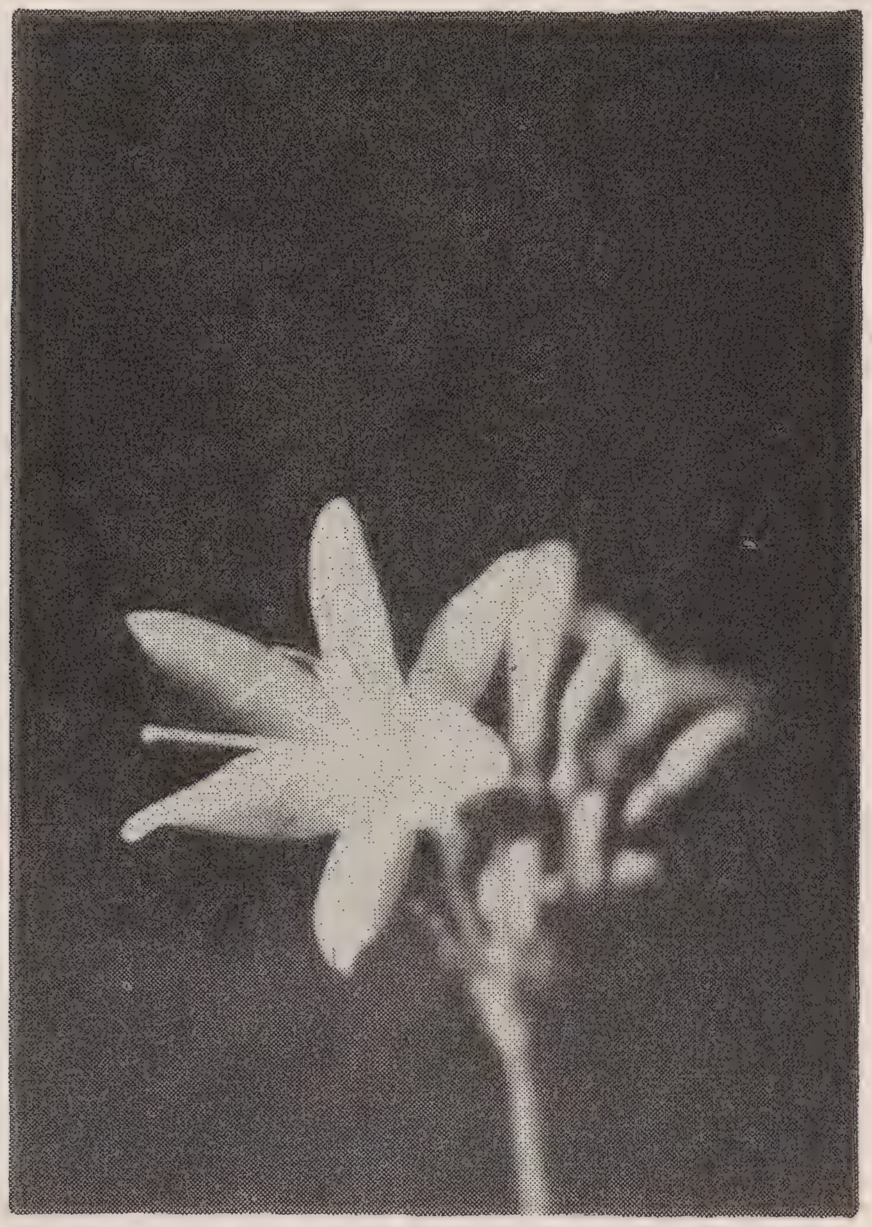

Fig. 39. Flower umbel of **Eucharis korsakoffii** Traub in its native habitat in Peru. Photo by Lee Moore.

HOLONOMENIFER (name bearer): J. N. Giridlian s.n. = No. 1060 (TRA), cult. Arcadia, Calif., 7-16-66, from bulbs collected by Lee Moore at the Hierra waterfalls, about 40 km. from the City of Moyobamba, Dept. of San Martin, Peru.

Notes.—This species is related to *Eucharis fosteri* and is of interest to those interested in breeding the smaller statured *Eucharis*.

SUBSECTION **MEXICANAE** OF SECTION **AMERALLIUM**, GENUS **ALLIUM L.**

HAMILTON P. TRAUB

Of the *Allium* species native to Texas, New Mexico and Arizona in which the bulbs *are not* inclosed in a persistent reticulum of fibers, but have thin membranous coats with sparse vertical veins, only (a) *Allium cernuum*—of the *Cernuae Alliance*—with white or pink flowers, and *conspicuously* 6-crested ovaries; and (b) *Allium kunthii (longifolium)*, *A.* glandulosum (and possibly *A. rhizomatum*)—of the *Kunthii* (longifolium) Alliance *—are reported as extending their ranges into Mexico. Thus, newly collected *Allium* species in the border area and in Mexico not agreeing with the four species mentioned, would be examined as to their status as possible additions to the two Alliances indicated, or possibly to other Alliances.

Thus matters stood when Dr. T. M. Howard started collecting *Allium* species in 1957 in the U. S.—Mexican border area, and also in Mexico, and more recently also into Guatemala. Of the 15 lots collected by Dr. Howard prior to 1967, ranging from southwestern Edwards County, Texas, to Nueva Leon, Durango, Hidalgo, Mexico State, Michoacan, Jalisco, San Luis Potosi, and southwestern Guatemala, one was identified as *Allium glandulosum* (Hidalgo), one from Michoacan, etc., as *A. kunthii (longifolium)*, four proved to be new to science, and others remain to be identified.

On the basis of the study of living material whenever possible, this brief review of the Subsection *Mexicanae* of the Section *Amerallium*, genus *Allium* L., is presented.

For the second subsection—Subsect. II. *Canadensae*—including 11 species, the reader is referred to the comprehensive treatise by Ownbey & Aase (1951; 1959).

It is of interest to note, that in his extensive exploring trips south of the border, Dr. Howard has observed that ''These are mainly summer and fall blooming. Some grow well in fairly wet places (due to frequent rains) but always where drainage is good. Others grow in nearly semi-arid country, but at good altitudes. I have never found them in tropical or semi-tropical low areas. They favor the plateau country. . . . The outstanding feature that impressed me is the bulb-bearing underground stems (rhizomes) produced by many of them. I had never seen this before in other Alliums that I have known.''

The apparent affinities are tentatively indicated in the following key. Six of the eight species are described in detail. Two new species will be described later.

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* There is a probability that the epithet **kunthii** has to give way to **longifolium,** and for that reason this group is hereafter referred to as Subsection **Mexicanae.**

KEY TO THE SPECIES OF SUBSECTION **MEXICANAE**, SECTION **AMERALLIUM**, GENUS **ALLIUM**

1a. Bulbs coats thin, membranous, with vertical veins fairly widely spaced; ovary sometimes crested; species usually flowering in summer and autumn, rarely in spring:

SUBSECTION I. **MEXICANAE**

2a. Spring and early summer-flowering species:
  3a. Spring-flowering species; umbel 10—30 flowered in March and April; flowers campanulate, tepals white or pinkish. Range.—Texas: e. Bexar and adjacent Wilson and Atacosa counties . . . . 1. **elmendorfii**
  3b. Early and mid-summer-flowering species:
    4a. July-flowering; flowers pink Range.—s. w. Guatemala: s. of Huehuetenango (to be descr. later) . . . . 2. **guatemalense**
    4b. July-flowering; roots **coarse,** bulbs oblong; flowers lavender. Range.—Tamaulipas, Mex. (to be descr. later) . . . . 3. **mexicanum**
2b. Late summer—and autumn-flowering species:
  5a. Plants not robust; leaves several, relatively slender, tax:
    6a. Bulbs not produced on long slender rhizomes:
      7a. Plant glabrous throughout; August-September flowering; leaves light green, smooth; scape lateral, umbel centripetal, many-flowered; flowers white, tepals spreading. Range.—Texas: s.w. Edwards County, 5 mi. s.e. of Carta Valley . . . . 4. **howardii**
      7b. Leaves glaucescent, bulbs splitting in two vertically; scape central; umbel centripetal, 8—10—16—flowered; in October, flowers campanulate, light lavender, with deeper mid-vein. Range. —Nueva Leon: w. of Monterrey . . . . 5. **traubii**
    6b. Bulbs produced on long slender rhizomes; umbel few-fld in August; tepals pale, with purplish or pinkish mid-vein. Range.—New Mexico: Gila Hot Springs . . . . 6. **rhizomatum**
  5b. Plants relatively robust; leaves relatively longer, upright:
    8a. Flowers in September-October, brownish red (mahogany); nectaries on ovary opposite the 3 petepals; tepals spreading. Range.—Central Mexico: Hidalgo: n. of Jacala, etc.; and southern Honduras . . . . 7. **glandulosum**
    8b. Leaves relatively longer, erect, thick, slightly concave in lower part, subterete in upper part; flowers in late autumn; umbel few-many-fld; flowers campanulate, tepals white or pink. Range.—Central Mexico: Michoacan; Mexico State & Jalisco, etc. . . . . 8. **kunthii (longifolium)**

1b. Bulbs enclosed in a reticulum of fibers:

SUBSECTION II. **CANADENSE** Ownbey ex Traub

(For species nos. 9 through 19, see Ownbey & Aase, Res. Stud. State Coll. Wash. 23(4). 1955; and Rhodora 61: 70-71. 1959.)

Section I. AMERALLIUM Traub, **sect. nov.**

Vestimentis bulbi tenuibus membranaceis, venis aliquot verticalibus ornatis, vel vestimentis bulbi reticulo fibroso persistenti ornatis; ovario interdum cristato. Species vernali vel aestivali vel autumno florentes.

Bulb-coats thin, membranous with some vertical veins, or bulb-coats with a persistent reticulum of fibers; ovary sometimes crested; species flowering in spring, or summer, or autumn. Type: *Allium canadense* L.

Subsection I. **MEXICANAE**

Vestimentis bulbi tenuibus membranaceis, venis verticalibus aliquantum late dispositis ornatis; ovario interdum cristato. Species vernali vel aestivali vel autumno florentes.

Bulb-coats thin, membranous, with vertical veins fairly widely spaced; ovary sometimes crested; species flowering in spring, or summer, or autumn.

1. ALLIUM ELMENDORFII M. E. Jones ex Ownbey, in Res. Stud. State Coll. Wash. 18: 218—219. 1950; "*Allium elemendorfii*" M. E. Jones, in Contrib. West Bot. No. 18, p. 20, 1935, *anglice.*

nf.: M. E. Jones 29071 (P), Bexar County, Texas, Apr. 3 (= Apr. 1). 1932.

Bulb ovoid, bearing a few short-stalked basal bulblets, innermost coats whitish, the cells of the inner epidermis vertically elongate or contorted, with very sinuous walls, outer coats (tunics) thin, membranous, without persistent fibers, fleshy bulb-scale 1, mildly garlic-flavored. *Leaves* 3 or more per bulb, channeled, concave-convex in cross-section, 1—2 mm. wide, entire, equaling or exceeding the scape in length, green at anthesis. *Scape* 15—40 cm. long, terete or nearly so, sometimes two produced successively from a single bulb. *Spathe* membranous, acuminate, breaking before anthesis into 3 or 4 ovate, acuminate, 3—5 nerved, separate or partially united valves. *Umbel* 10—30-flowered, erect. *Pedicels* usually more than twice as long as the perigone, elongating in fruit, becoming subequal in length, rigid, and somewhat flexuous. *Perigone* campanulate, *tepals* about 5 mm. long, lanceolate, obtuse, entire or nearly so, somewhat spreading, white or pinkish, withering away from the fruit, with the midribs slightly thickened. *Stamens* shorter than the perigone, *filaments* subulate, dilated below and united into a staminal cup at the base, *anthers* oblong, obtuse. *Ovary* crestless, *style* linear about as long as the filaments; *stigma* entire or distinctly lobed. *Seeds* black, shining, finely alveolate, alveoli smooth.

Range.—Endemic to Texas, collected only on the Carrizo Sands of eastern Bexar and adjacent Wilson and Atascosa counties.

Notes.—Flowering in March and early April. Easily distinguished from *A. kunthii* and *A. glandulosum* by the cluster of stipitate bulblets at the base of the main bulb, and by the very sinuous walls of the cells of the inner epidermis of the innermost bulb coats. When these are replaced and forced outward by the growth of the bulb, these "cellular reticulations" are then found on the now dead outer coats. *A. elmendorfii* in some respects also resembles *A. runyonii* of subsection *Canadensae.*

2. ALLIUM GUATEMALENSE (to be described later); July blooming; flowers pink. Range.—s. of Huehuetenango, s. w. Guatemala.

3. ALLIUM MEXICANUM (to be described later). Range.—vicinity of Marcello & Hermosa, Tamaulipas, Mex.

4. ALLIUM HOWARDII Traub, *sp. nov.*

Bulbo ovoideo 2.2 cm. longo, 1.4 cm. diametro, tunicis membranaceis; foliis deorsum vaginatis, partibus liberis 4—6 linearibus acutis 14.5—18 cm. longis 2—3 mm. latis glabris pallide viridibus laevibus; scapo laterali; spatha monophylla; umbella multiflora; floribus albis umbellam compactam centripetlaem conficientibus; pedicellis usque ad 1.2 cm. longis; segmentis tepalorum 9 mm. longis 3 mm. latis patentibus; staminibus 7 mm. longis; filamentis subulatis; ovario 3-lobato minute 3-cristellato, cristulis pallide viridibus; ovulis per loculam 2. Type: Traub No. 1058 (TRA), cult. from bulbs collected by Dr. T. M. Howard in s. w. Edwards County, Texas.

Bulb ovoid, 2.2 cm. long, 1.4 cm. in diam., tunics white, with vertical veins rather widely spaced, membranous. *Leaves* sheathing below for 4.5 cm., (only 1.3 cm. above ground) forming a pseudo-stem 3 mm. in diam, slender; free portions of the leaves 4—6, linear, acute, in a lax cluster, 14.5—17—18 cm. long, 2—3 mm. wide, glabrous, light green, smooth, slightly concave to almost flat in upper part, rounded below. *Scape* lateral, up to 37.5 cm. long (above ground), somewhat flattened, 2 x 2.7 mm. in diam., light green. *Spathe* monophyllous, white, membranous, rupturing to one side by the pressure from the expanding flower buds, 1.5 cm. long. *Umbel* many-flowered, in a centripetal compact umbel, flowers open 1, 2 or a few at a time over a period of a few weeks, flowers are pure white, except for three minute greenish crests on the ovary; pollen is cream-colored; tepalsegs are spreading (patent). *Pedicels* up to 1.2 cm. long at anthesis, slender, green. *Tepalsegs* 9 mm. long, 3 mm. wide; setsegs lanceolate, acute; petsegs oblong, acute; shriveling after anthesis. *Stamens* 7 mm. long, filaments subulate below; anthers 1 mm. long at anthesis, introrse, versatile, pollen cream-colored. *Ovary* 3-lobed, 2.5 mm. long, 2.5 mm. in diam., white, except for 3 minute light green crests on the ovary; ovules 2 per locule; nectaries are in cavities at the base between the 3 inner stamen-filaments and the ovary, but the nectar is not visible. *Style* white, shorter than the stamens at first, later slightly overtopping the stamens after anthesis. Anthers and the stigma do not mature at the same time (= dichogamy); anthers dehisce within the first 12 hours after flowers open, when style is 1—1.5 mm. long; after anthesis, the style elongates to 4 mm., slightly longer than the stamens. At La Jolla, Calif., the pollen is transferred by the beautiful insect, a solitary bee, *Agapostemon* sp. (identified by Dr. A. F. X. Williams, San Diego Natural History Museum), which extends its tongue into the nectary cavities, and in walking over the compact umbel, pollinates the flowers. Stigma capitate, minute. *Capsule* trigonous, obscurely 3-crested on top; (fresh) seeds black, angular, 3.5 mm. long, 2—2.5 mm. in diam.

Range.—Southwestern part of Edwards County, Texas.

5. ALLIUM TRAUBII T. M. Howard, in Plant Life 23: 62. 1967.

Nf.: T. M. Howard, s. n. (TRA 1061), cult. San Antonio, Tex., Nov. 18, 1966, grown from bulbs collected by Dr. Howard in the Mountains in the vicinity of Monterrey, Mex.

Bulb oblong, 2 cm. long, 1.2 cm. in diam., bulb-neck 2.2 cm. long, 4 mm. in diam.; outer tunics membranous, dark brown; bulb splitting into two bulbs. *Leaves* sheathing below to 5 cm., free portions 11—14—15—17—18—19 cm. long, 2.5 mm. in diam. (up to 2.75 mm. wide under culture), glaucescent, concave, above, 3-ridged, prominently so under culture, on the back, apex acute. *Scape* subterete, 23.5 cm. long, 1.5 mm. in diam. *Spathe* lanceolate, whitish, 9.5 mm. long, rupturing to one side by the pressure of the expanding pedicels and flower buds. *Umbel* 8—10—16-flowered; flowers campanulate, very pale lavender (almost white), with deeper mid-vein, changing to lavender, with deeper lavender mid-vein, after anthesis. *Pedicels* 1—1.1—1.2 cm. long at anthesis, slender. *Tepals* lanceolate, acute, 6.5 mm. long, 2.75 mm. wide, shriveling and conniving in fruit. *Stamens* slightly shorter than the tepals; anthers 1 mm. long, introrse, versatile, pollen very pale lavender. *Ovary* white, 2 mm. long, 2.5 mm. in diam.; *style* white, 4.5 mm. long, stigma minute.

Range.—Mexico, State of Nueva Leon, in the mountains in the vicinity of Monterrey.

Notes,—Collected by Dr. T. M. Howard. Differs from *A. howardii* in its glaucescent leaves, 3-ridged on the back, later flowering season (November), fewer-flowered umbel, campanulate light lavender flowers, absence of ovary crests, and other features.

6. ALLIUM RHIZOMATUM Wooton & Standley, in Contr. U. S. Nat. Herb. 16: 114. 1913.

Nf.: E. O. Wooton (U. S. Nat. Herb. No. 690251, US), collected at the Gila Hot Springs, New Mexico, Aug. 20, 1900. Transition Zone.

Plant about 20 cm. high. *Bulb* ovate, about 1 cm. in diam., the outer coats grayish and opaque, the inner white and hyaline, with a few indistinct vertical nerves but not reticulate; the bulbs arising from slender scaly rhizomes, 2—3 cm. long. *Leaves* 2—3 mm. wide, much broader and clasping at the base, very finely serrulate. *Scape* terete. *Spathe-valves* 2, broadly ovate, scarious, at first pinkish-veined, becoming reflexed and white. *Umbel* few-flowered, erect. *Pedicels* (in young umbels) 1 cm. long or less. *Flowers* small for the genus, *tepals* oblong to oblanceolate, acute, 6—8 mm. long, pale with purplish or pinkish mid-vein, slightly carinate at the base. *Stamens* subequaling the tepals, included; *filaments* dilated at the base and forming a staminal cup. *Stigma* simple; *ovary* slightly crested.

Range.—New Mexico: Gila Hot Springs. Transition Zone.

Notes.—Wooton in a personal communication (Nov. 20, 1944) to the writer, stated that *Allium rhizomatum* is "very conspicuously different" from all material of *Allium glandulosum* Link & Otto that the authors of the species have seen. The present writer has verified this statement on the basis of herbarium studies.

7. ALLIUM GLANDULOSUM Link & Otto, Ic. Pl. Rar. Hort. Berol. 1: 33, pl. 17. 1841; Ownbey, Res. Stud. State Coll. Wash. 15: 224-225. 1947; 18: 219-220. 1950.

Syn.—"Allium longifolium Lindl." (misapplied name), in Bot. Reg. 12: pl. 1031. 1826-27, non (H.B.K.) Humboldt, 1835.

Plant robust. *Bulb* obovoid, 1.5 cm. long, 1.1. cm. in diam.; tunics white, thin, membranous, vertical veins rather far apart. *Leaves* sheathing below up to 6.5—8.5 cm., forming a deciduous pseudo-stem, 6—8 mm. in diam., reddish; *free leaf portions* 4—5, upright, 24—28—30 cm. long, 4.5—6 mm. wide in lower part, glaucescent, green, deeply concave in lower ½ to ¾, sometimes nearly flat above, apex bluntly acute. *Scape* central, up to 50 cm. long, stout, deep green, slightly flattened, 4.5x6 mm. in diam., with prominent edges, narrowing gradually to the apex, 1.5x2 mm. in diam., apparently functioning as a photosynthetic organ as leaves somewhat decline; often a second smaller scape, also central, up to 30—40 cm. long, 2.5x3 mm. in diam., arises alongside the same scape, supporting a somewhat smaller umbel with fewer flowers. *Spathe* monophyllous, closed, white, membranous, 2.2 cm. long, lanceolate, soon rupturing due to the pressure of the expanding pedicellate flower buds. *Umbel* many-flowered (approx. 40—45-flowered), centripetal, second umbel, if present, with fewer flowers (approx. 22—25), umbels lax, 1, 2 or a few flowers opening in succession, mostly bending downwards below the umbel-base in fruit; flowers brownish-red (mahogany), tepals spreading (patent), moderately perfumed. *Pedicels* 2—2.2 cm. long at anthesis, slender, elongating somewhat after anthesis. *Tepals: setepals* almost linear, acute, 7.5 mm. long, 2.5 mm. wide; *petepals* elliptic. bluntly acute, 7.5 mm. long, 3 mm. wide, with deeper shining mahogany coloring near the base; tepals shriveling and conniving in fruit. *Stamens* 5 mm. long, subulate, united into a very short staminal cup; stamens slightly shorter than the tepals, bending outwards; *anthers* 1 mm. long, introrse, versatile, pollen ash-gray. *Ovary* conical, 2 mm. long, a nectar gland (circular opening) on ovary less than half way up on ovary wall opposite each of the 3 petepals; nectaries exude large globules of nectar (when absorbed with blotting paper, the nectar gradually reappears; no pollen carrying insects were observed during the day, and thus apparently the perfume may induce insects to visit the flowers at night); style 1—1.5 mm. long at anthesis, elongating to 4 mm. long after anthesis (style matures after anthesis = dichogamy); stigma pointed. *Capsule* trigonous, 4.5 mm. long, 5.5 mm. in diam.; seeds black, angular, 2 mm. long, 1.5 mm. in diam.

Range.—Central Mexico; recently re-collected in the State of Hidalgo by Dr. Howard; and southern Honduras.

Notes:—*Allium glandulosum* ranks among the most distinct species in the genus, and could not possibly be confused with any other. It is a robust plant with strong green scapes which take over the photosynthetic function when the leaves decline and gradually fall away after the flowers fade. The flowers are brownish-red (mahogany) numerous in the umbel with relatively long pedicels; the tepals are spreading; the ovary, and seeds are relatively small. The flowering season at La Jolla was relatively long (from mid-September to the end of October). It differs in these and still other features from its nearest relative, *A. kunthii (longifolium)*.

When the above description was taken down, the presence of rhizomes had not been verified in *A. glandulosum.* After the seeds were harvested in late November, the underground parts were studied, and this revealed *robust, smooth* white rhizomes which are entirely different from the *slender, scaly* rhizomes in *A. rhizomatum.* This definitely validates the latter species which is also characterized by a smaller, slender plant. In *A. glandulosum,* the *stout, green* scapes that carry on *photosynthetic activity,* and which persist after the leaves have been shed, apparently provide the food needed for the full development of the stout rhizomes.

When the spathe ruptures, the lower circle of pedicels are free, but above these there are at least two bundles of pedicels with short, white membranous sheaths at the base. These and the spathe more or less disintegrate by the time the seeds ripen.

Recent specimens: A Molino R. (Standley Herb. 14615 = 2445403 US), 8-14-64; between Las Pacayas y El Frijolar, Dept. El Paraiso, Honduras; Traub n. 1062 TRA, 10-29-66, cult. La Jolla, Calif., from bulbs collected by T. M. Howard, Hidalgo, Mex.

8. ALLIUM KUNTHII G. Don, Mem. Wern. Soc. 6: 82. 1827; Morton Herbertia 7: 73. 1940 (1941); Ownbey, Res. Stud. State Coll. Wash. 18: 221—222. 1950 (1951).

Syn.—*Schoenoprasum lineare* H.B.K., Nov. Gen. et Sp. 1: 277. 1816, non *Allium lineare* L., Sp. Pl. 295. 1753; (between Santa Cruz de la Sierra and Mt. El Gigante, alt. 1300 hex.; September-flowering); *Schoenoprasum longifolium* H.B.K., Nov. Gen. et Sp. 1: 277. 1816; (Queretaro State: Aroyozarco and San Juan del Rio, alt. 1015 hex.; August-flowering); *Allium longifolium* (H.B.K.) Humboldt, in Sprengel, Syst. Veg. 2: 38. 1835; *Allium scaposum* Benth. Pl. Hartweg. 26. 1840.

Bulb ovate to subglobose, about 2 cm. in diam., tunics thin, membranous, with vertical veins fairly widely apart. *Leaves* sheathing below to 8—15 cm. forming a sheathing stem 6 mm. in diam. (5—12 cm. of the sheathing stem is above ground), usually somewhat reddish; free portions of leaves 3—5, 24—29—32—43—46 cm. long, 3.5—4 mm. in diam., concave on upper side to ¾ of its length, subterete above; deep green, acute. *Scape* 15—30 cm. long, terete or somewhat ridged, often 2 or more produced successively from a single bulb. *Spathe* membranous, acuminate, rupturing by the pressure of the developing pedicels and flower buds. *Umbel* 8—15-flowered. *Pedicels* unequal in length, about twice as long as the perigone, rarely arcuate or flexuous. *Perigone* broadly campanulate, tepals 4—8 mm. long, lanceolate, acute or acuminate, white keeled reddish, withering in fruit. *Stamens* shorter than the perigone, filaments broadly dilated below and united into a staminal cup at the base, anthers oblong, obtuse. *Ovary* crestless; *style* linear, shorter than the perigone, *stigma* capitate, entire. *Seeds* dull black.

Range.—Mexico: central region. Recently re-collected in the state of Michoacan by Dr. T. M. Howard.

Notes.—Markedly different from *A. glandulosum* which has wider, not subterete leaves in the upper part; and the flowers are totally different.

The 1 very short, or 2 longer rhizomes with a bulb at each apex, observed in *A. kunthii,* are similar to the 4 long rhizomes produced in *A. glandulosum.*

Subsection II. **CANADENSAE** Ownbey ex Traub, **subsect. nov.**

Bulbis reticulo fibroso persistenti obtectis; ovario interdum cristato.

Bulbs inclosed in a persistent reticulum of fibers; ovary sometimes crested. Type: *Allium canadense* L.

For species nos. 9 through 19, see Ownbey & Aase, Res. Stud. State Coll. Wash. 23(4): 1955, and Rhodora 61: 70-71. 1959.

TRAUB—SUBSECTION **MEXICANAE,** continued on page 110.

PLANT LIFE LIBRARY—continued from page 33.

PRIMROSES AND SPRING, by Doretta Klaber. Wm. Morrow & Co., 425 Park Av. S., New York 16, N. Y. 1966. Pp. 125. Illus. $3.50. This new book on primroses contains notes for beginners; popular descriptions of European mountain primulas and Asian woodland Candelabra and other bog primroses; primulas for specialists; and growing primroses from seeds. Recommended to all interested in primroses.

RESIN AND GLASS ARTCRAFT FOR FLOWER ARRANGERS AND CRAFTSMEN, by Laura Smith. Wm. Morrow & Co., 425 Park Av. S., New York 16, N. Y. 1966. Pp. 115. Illus. $4.95. This new book is designed to instruct both advanced artists and beginning craftsmen in the art of making resin and glass mosaics, and other colorful objects from the materials. Highly recommended.

ISLAND LIFE, by Sherwin Carlquist. Doubleday & Co., 277 Park Av., New York, N. Y. 10017. 1965. Pp. 451. Illus. $9.95. Subtitled "A Natural History of the Islands of the World", this stimulating, profusely illustrated book is concerned with the organisms that reach and evolve under the special, isolated habitat conditions of islands, and this provides the unifying theme. The rest of the book is concerned with particular examples of island life. This book is required reading for all biologists and is highly recommended.

PLANT PATENTS WITH COMMON NAMES, 1965 SUPPLEMENT 2465 THROUGH 2584. Publ. by the Amer. Assoc. of Nurserymen, 835 Southern Bldg., Washington, D. C. 20005. Pp. 7. $0.50. This is a supplement to the listings of plant patents previously published. The subject matter is arranged under three parts: I. Numerical listings; II. Alphabetical listing under common names; III. Alphabetical listing of names and addresses of originators or discoverers and assignees.

ELSEVIER'S LEXICON OF PLANT PESTS AND DISEASES, compiled by Manuel Merino-Rodriguez. Elsevier Publ. Co., 52 Vanderbilt Av., New York, N. Y. 10017. 1966. Pp. 351. Illus. $16.50. Using Latin as the basic language, the author has compiled a comprehensive number of vernacular names in English, French, Spanish, Italian and German. In Part I, the basic tables are arranged alphabetically within each section according to the Latin name of the living form together with the common name in the other languages. Part II comprises separate cross-keyed indices for each of the languages included in the basic table. This comprehensive lexicon is recommended to all plant pathologists.

BIOLOGY, ITS PRINCIPLES AND IMPLICATIONS, 2nd. ed. by Garrett Hardin. W. H. Freeman & Co., 660 Market St., San Francisco, Calif. 94104. 1966. Pp. 771. Illus. $9.50. This 2nd edition of a stimulating, up-to-date introduction to biology will be welcomed by all biologists. The five parts of the text are concerned with life at the cellular level; equilibria, ecology and evolution; our plant-dependent world, the animal way of life, and heredity. Highly recommended to all students of biology.

FLORA OF JAPAN (IN ENGLISH), by Jisaburo Ohwi; edited by F. G. Meyer and E. H. Walker. Smithsonian Institution, Washington, D. C. 20560. 1965. Pp. 1067. Illus. $25.00. This enlarged and revised English translation of Ohwi's "Flora of Japan" (in Japanese), represents a comprehensive lineagic treatment of the approximately 4,500 species and varieties of plants and ferns of Japan, from Hokkaido to Kyushu, including descriptions and keys to all families, genera and species with their habitats and distribution. This fine English edition represents the first flora of Japan in any western language since 1879, and thus is indispensable to all interested in flowering plants and ferns. Highly recommended.

PLANT BIOCHEMISTRY, edited by James Bonner and J. E. Varner. Academic Press, 111 Fifth Av., New York, N. Y. 10003, 1966. Pp. 1054. Illus. $19.00. This up-to-date book on the biological activities of plants, incorporating contributions from a large number of outstanding authorities, is designed for both students and professional workers in the plant sciences. The five parts are concerned with the plant cell, its substructures and subfunctions; basic metabolism; control; and autotrophy. This stimulating book is recommended to all plant scientists.

SYMBIOSIS; ITS PHYSICAL AND BIOLOGICAL SIGNIFICANCE, edited by S. Mark Henry. Vol. I. Academic Press, 111 Fifth Av., New York, N. Y. 10003. 1966. Pp. 478. Illus. $16.50. This comprehensive first volume, incorporating contributions from nine outstanding authorities, is concerned with symbiotic relationships involving microorganisms, plants, and marine organisms. The subjects covered include intermicrobial symbiosis; lichens; bacterial symbiosis with plants; mycorrhiza and other plant symbioses; symbiosis in marine organisms; cleaning symbiosis in the marine environment; and experimental analysis of behavior in symbioses. Highly recommended to all biologists.

THE ORIGIN OF CULTIVATED PLANTS, by Franz Schwanitz. Harvard University Press, 79 Garden St., Cambridge, Mass. 02138. 1966. Pp. 175. Illus. $4.75. This translation by Gerd von Whalert, from the German edition of 1957, will be welcomed by plant biologists. The author first explains the differences between wild and cultivated plants; and then discusses the genetic bases of the origin of cultivated forms. After considering the influence of the environment on the origin of cultivated plants, he concludes with a history of the science of plant breeding, which he characterizes as an evolutionary process guided by man. This stimulating book is very highly recommended to plant breeders and plant biologists generally.

LIBERTY HYDE BAILEY, by Andrew D. Rodgers III. Hafner Publ. Co., 31 East 10th St., New York, N. Y. 10003. Facsimile Reprint, 1965. Pp. 506. Illus. $10.00. This facsimile reprint of the 1949 edition of the biography of Liberty Hyde Bailey will be welcomed by biologists generally. This is not the usual biography. Here the life and work of this outstanding pioneer scientist are presented in the context of the development of the plant sciences and other sciences related to agriculture, in the United States and Canada. This is summed up as "A Story of American Plant Sciences" in the subtitle. Dr. Bailey's contributions to plant lineagics and cultivated plants is emphasized. This is a book that belongs in the library of every biologist. Very highly recommended.

3. GENETICS AND BREEDING

A YEAR OF ANTICIPATION

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The past year for the writer has been a year of anticipation. Moving to California required adjustments that had to be made, but it also brought new friendships, and opened up new sources of breeding material. As a result, he is now looking forward to some beautiful surprises in the form of new Amaryllis hybrids within the next few years.

Since moving from Colorado to the coastal area of Southern California, a number of problems have been encountered. The soil being so different, and the dried cow manure on the market reputed to contain much salt, it was necessary to decide upon a new potting mixture, which has required considerable experimentation. Having always grown Amaryllis in pots, it was decided to continue doing so, but without the benefit of a greenhouse. From personal observation, however, it was soon evident that Amaryllis would do better with some protection from the sun in summer and from the low temperatures on the colder nights in winter. These problems have been at least partially solved recently by constructing benches along the east side of the house, on which the potted bulbs are placed. These benches have a plastic windbreak on three sides and a hood over them, which is composed of plastic and some shading material such as screen wire. Beneficial results from this protection are already evident. The writer had very little trouble with the red blotch fungus disease of Amaryliss in Colorado, but it seems to be quite prevalent this year in California. It is hoped that these hoods over the Amaryllis, by reducing the amount of cold moisture condensing upon the plants at night, will improve this situation. Although growing Amaryllis in pots on benches may limit somewhat the number of bulbs grown, and a real freeze would have serious consequences, nevertheless there are some advantages to this method. There is no need to get down on the ground to work with the bulbs, there is no struggle with weeds, and the numerous giant snails here in California have given no trouble at all.

The past year has been one of making new friends who are also interested in growing Amaryllis. The writer promptly joined the Southern California Hemerocallis and Amaryllis Society, and has received much in the way of inspiration and help from this local society. Anyone interested in Amaryllis is urged to join a local society if at all possible, for having lived many years in a region where no such organization existed, the writer can testify to the value of one. Several members of this local society have been of considerable assistance to him in his search for breeding material, exchanging mature bulbs, seedlings, seed, and pollen with him. This pollen for example, has enabled him to make a number of very interesting crosses, such as a Striata hybrid crossed with a Calyptrata hybrid.

Because of our move to California in the middle of last year's growing season, very little has bloomed so far this year, but much new material has been acquired for future hybridizing work. More than twenty additions have been made to the writer's collection of species and direct crosses with species, much of this being from new friends in the local Amaryllis society. This collection now includes twenty-five different species or varieties of species. The direct crosses, having at least one species for a parent, involve the following species: striata (possibly seven different forms of this species), psittacina, vittata, immaculata, calyptrata, evansiae, aulica var., platypetala, belladonna var. haywardii, aglaiae, pardina, reginae (identity of the last two is questionable), and two unidentified species. Much of this material is not yet of blooming size; so the next few years should be very interesting. It might also be noted that some unusual Dutch hybrids have been secured from a local florist who imports his seed from Holland and raises hundreds of Amaryllis yearly. One such was a white with a pronounced yellow tinge, and another was very close to being a true purple. One of the Amaryllis Society members had a hybrid between A. evansiae and A. galaiae in bloom when this yellowish white bulb was secured, it also being in bloom, and the two were cross-pollinated, but without any success.

The primary objective of the writer's breeding program is to develop a recurrent-blooming type of Amaryllis. All of his Striata crosses have been made with this end in view, and the keeping of careful records has revealed that several of these Striata hybrids are dependable recurrent bloomers. One of these is a rather striking red orange of graceful form, which has been used extensively in further crosses. Other recurrent-blooming Striata hybrids have been received from friends in the past year. In addition, the Hadeco clone TANGERINE, and an unnamed Indian miniature hybrid, have also proven to be definite recurrent bloomers. From the reports of friends, it is also likely that a number of recent Dutch hybrids may be recurrent bloomers.

A secondary objective is to develop more summer or fall-blooming hybrids, and some of this new material is directed towards this goal. Through the kindness of Dr. Traub, the early hybrid Amaryllis x acramannii was secured, but it has not yet bloomed for me. From R. D. Goedert was secured a hybrid of A. aulica var. platypetala; this bloomed in September of 1965 for the first time. The flowers were about six inches in diameter, in color a rose red with deep red throat markings, and were held quite erect. The leaves have a definite purple cast to them. All crosses made with this hybrid ended in failure. However, it remained evergreen all winter, and a flower bud was just discovered coming along with new leaf growth as this article was being written in mid-June of 1966, which indicates that it will be a late summer bloomer. Perhaps this year a cross may be successful. Another summer bloomer has just been discovered among some Tunia Australian hybrids raised from seed. This bulb, a sparkling white, bloomed in July of 1965, and is going to bloom again this year about the same date.

From R. D. Goedert was also secured a bulb labeled LM 63-1, which may be A. reginae. This bloomed for the first time in August of 1965. The flowers were rather small, slightly less than four inches in diameter, and were a bright red with a small white star in the throat. Only one of the crosses made with it was successful, and this happened to be with another one of the writer's recurrent-blooming Striata hybrids, a cross between the Houdyshel orange scarlet hybrids and A. striata (reference was made to this cross in the 1966 Yearbook). Just now this LM 63-1 bulb is apparently going into a resting period for the first time; so it may bloom again in late summer. This past winter another Lee Moore bulb labeled PERU #10 was obtained from a member of the local Amaryllis Society, and it bloomed in February, 1966. The flower was very similar to that of LM 63-1, but the leaf growth so far seems to be somewhat different. None of the crosses made with this bulb were successful.

In conclusion, the writer wishes to offer a suggestion to all local Amaryllis societies. One member of the Southern California society has been searching the gardens of her neighbors, and has located several unusual Amaryllis. It is suggested that both hybrids and species believed to be lost or unavailable may actually be growing in some garden, particularly in the subtropical regions of this country, and local Amaryllis societies might do well to organize a search for such material. This could be one phase of a definite program set up by each local society, a program designed to encourage more society members to engage in hybridizing activities. In addition, a list should be compiled of all the species and important hybrids being grown by the members, and then whenever possible, offsets, seed, and pollen should be distributed as widely as possible among those interested. Such a program would certainly create new interest in any local society, and furnish years of anticipation for every member.

AN AMARYLLIS BREEDING PROJECT

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My interest in amaryllis goes back about eight years and resulted from my contacts with Prof. Claude Davis and the late Prof. Ira Nelson. Let me say that these contacts were most interesting and enjoyable and developed as a result of my interest in Louisiana irises, an interest that is still carried on quite extensively.

Original efforts with amaryllis centered around the named Dutch hybrids and seedlings grown therefrom. All of these are grown outdoors as the winters in Baton Rouge are normally very mild. A fairly heavy mulch suffices to protect the bulbs even in exposed areas. The most noteworthy result from growing several hundred Dutch seedlings is a series of picotee whites derived from the cross ''Nivalis'' X ''Apple Blossom''. Some of these are exceptionally large and beautiful.

Although many beautiful seedlings can be obtained by crossing the named Dutch clones, the urge to produce something different won out and about 1960 I began a collection of amaryllis species. The objective was to use the species among themselves and with appropriate Dutch parents to produce forms and colors not otherwise available. This project has moved slowly but it is moving. Most of my species were obtained as small size or seedling bulbs and many are only now reaching blooming size. Then I was to learn of the frustrations of obtaining seed set with species compared to the relative ease of obtaining seed with the Dutch clones. The varied cultural requirements of the species present a real challenge and individual likes and dislikes vary widely. The following are some of my observations and experiences in growing the species.

A. Striata (Vars. *striata* and *fulgida*) and *A. belladonna* (from Bolivia and Brazil) were among my earlier acquisitions and have been good performers in pot culture. Pot culture is normally used for all my species. The pots remain outdoors from April thru October and are kept in a glassed-in patio during the winter. During the summer they get at least ½ day of sunlight and are fertilized with liquid fertilizer each month. These two species are now being tested in outdoor culture in protected areas. Seedlings derived from *A. striata* and *A. belladonna* with white Dutch clones are now 1-2 years old and are growing well.

It may be worthwhile to point out the technique I use for pollen storage. The pollen is placed in ½ ounce glass vials, labeled and stopped with cotton wadding. The vials are placed in a large mouth screw-cap jar in the bottom of which is placed about a ¾ inch layer of indicating ''Drierite'' (calcium sulfate dessicant available from chemical suppliers). The capped jar is stored on the lowest shelf of the refrigerator. As long as the ''Drierite'' remains blue it is good, when it turns pink it should be replaced. I have set seed with pollen stored for 5-6 months in this manner. The ''Drierite'' is a more convenient dessicant to use than zinc chloride and appears to be equivalent in performance.

A. evansiae was also acquired several years ago as a small bulb. The original bulb has bloomed for the last two years and several offsets have now reached blooming size. I have found that this species requires perfect drainage and must be watered only very sparingly during its period of rest in the winter. Excess moisture when *A. evansiae* is not in active growth is almost certain to cause rot. It seems to enjoy a good deal of moisture during its summer growing period. All attempts thus far to use *A. evansiae* as a pod or pollen parent have been unsuccessful.

The ''Senorita'' hybrids *(A. striata* X *A. evansiae)* developed by the late Prof. Ira Nelson are an outstanding group. Color and form are most unusual. Light pastel pink with creamy blush, or cream with a pink blush—words are not adequate to describe these delicate colors. The up-looking form accents the beauty of the ''Senorita'' hybrids. Pot culture is quite easy and the plants are vigorous growers and produce offsets freely. Some 200 or more one year old seedlings from

''Senorita'' crossed with Dutch parents are ready to be set out in the spring. It will be interesting to see the colors and forms of these hybrids.

One highly prized species which I was fortunate to acquire is *A. pseudopardina.* This species was described by Dr. Cardenas in *Plant Life,* Vol. 21 (1965). The bulb was acquired in the fall of 1964 and potted in a 9″ pot. It has grown very well for me and at this writing is in a state of semi-dormancy. It is treated about the same as *A. evansiae* with respect to watering. This may not be necessary but I don't want to take chances with rot. One small offset has formed and the bulb is about 2¾″ in diameter (an estimated 50% increase in size in one growing season). I hope to see a bloom scape within the next month or two.

Acquisitions during the past year include *A. starkii, A. psittacina, A. aulica* (var. *platypetala*), *A. cybister, A. mollevilquensis,* and *A. umabisana.* Among this group only *A. aulica* has bloomed.

I also have several of the unidentified species imported by Mr. Goedert. Some *striata* and *belladonna* forms have bloomed. One merits special comment. This is a species obtained under number SA 63-20 (from Brazil), which bloomed in January, 1965. Three scapes had 4, 3 and 2 flowers. The flowers differ markedly from the description supplied by Mr. Goedert's collector. The scapes are quite tall (one was 33″, the other two, 25″ and 28″) and the flower is almost 6″ across. The color is light pink with orange veining and a green throat. All 9 flowers were pollinated and, quite remarkably, all set seed pods. Not all of the seed was viable. Good crops of seedlings were obtained from selfing and with the ''Davis Hybrid'' (*A. evansiae* X *A. agliae*) as the pollen parent. This plant appears to fit reasonably close to the description Mr. Goedert gives for his unidentified species SA 62-3 (*Plant Life,* Vol. 21, 1965, pg. 129), supposed to be *A. striata crocata.* However, my SA 63-20 has a capitate stigma and a rather inconspicuous paraperigone, indicating it may be a *belladonna* rather than a *striata.*

THE BRITISH NERINE SCENE

J. T. Gallagher, *England*

Even with the best stock available it is not long before the enthusiast is tempted to join the bees in giving nature a helping hand. Given an objective programme the chances of success with the breeding of nerines are high and amply repay the small amount of time and work involved.

My own bulbs began to flower quite early last Autumn and although I had planned out my crosses for some time beforehand, I must admit that I was only partially successful in completing my programme. One of the fascinating aspects of some of the crosses I have made so far is the variable number of seeds produced, especially when using hybrids with higher chromosome numbers. This was strikingly exhibited this season by the aneuploid 'Joan'. 'Mariloo' x 'Joan' yielded 125 large very uniform seeds, the reverse cross, 'Joan' x 'Mariloo' yielded only 40 seeds which were very variable in size. Using the pollen of 'Joan' on the same number of flowers of an unnamed pale pink seedling from Exbury, which I believed to be a triploid, yielded 17 very large pale green seeds all of which have germinated. It will be some time before the results of these crosss will be known and I am beginning to realize the importance of keeping some notes to refresh one's memory!

My friend Mr. Smee of Ipswich in Suffolk wrote to me in great excitement to tell me of one of his new seedlings which had just come into flower for the first time. He had crossed 'King of the Belgians' with pollen from the old triploid 'Rotherside', one of the seedlings had very large flowers of great substance with the individual petals over ¾″ wide but spoilt by having a dirty puce colour and very erect pedicels. The flowers so large that Mr. Smee believes the seedling might be tetraploid, but it has not yet been possible to do a chromosome count to determine whether this is in fact the case.

Mr. Smee has developed a method of growing many of his bulbs in heated soil beds in his greenhouse. These are constructed with a base of concrete paving stones with concrete edging stones round the sides to give a depth of approximately nine inches and are filled with the normal soil mix used for growing nerines. The temperature of the soil is thermostatically controlled at 50°F. by means of electric heater cables and the air temperature in the greenhouse is maintained at 45°F. throughout the winter using a fan type heater. Bulbs are planted into the soil leaving the top third above the surface in the normal way. His results using this method are very remarkable both from the size and quality of the flowers and the rate at which the bulbs multiply. On the other side of the greenhouse other bulbs are grown in pots and although grown exceptionally well and convenient for exhibiting, the soil bed flowers are definitely superior. Perhaps his most fascinating nerine is a new white form of *Nerine bowdenii* recently imported from the Transkei which had a magnificent umbel of creamy white flowers on a 4′ scape.

Sir Frederick Stern has been a nerine fanatic for many years as well as being a very distinguished amateur horticulturist. As a close friend of the late H. J. Elwes he obtained many of the latter's better hybrids and has been crossing these, and selecting out and growing on the better seedlings. He very kindly invited me down to HIGHDOWN, his famous garden at Worthing, Sussex, which is on the south coast about 60 miles from London. Sir Frederick is a pioneer of the application of scientific principles to planned breeding. Used on many of the plants in his own garden the results speak for themselves as it is hard to think of any grower who has won more major awards for so many different types of plants he has bred. It was under his chairmanship of the board of trustees that a separate department of cell biology and cytology was set up at the JOHN INNES HORTICULTURAL INSTITUTE some years ago.

When I arrived we immediately went up to the greenhouse where Sir Frederick and Lady Stern were selecting the best seedlings for naming. Most exciting was a new pale orange seedling which was the result of a cross between 'Grilse' x 'Bonnerole'. It is best described as an orange form of 'Roza Stevenson'. We decided that this wonderful new hybrid should be called 'Sybil' in honour of Lady Stern. Another lovely orange variety 'Gloaming' x 'Jewel' is to be called 'Highdown Orange'. Unfortunately I was too late to see 'Catherine' which flowers early and was given a Preliminary Commendation by the Royal Horticultural Society a week or two before.

I was most anxious to find out as much as I could about Mr. Elwes collection and was fascinated to learn that it was in fact quite small considering the number of excellent hybrids he had bred. Later, during a tour of the garden which is on pure chalk, Sir Frederick told me some of the stories behind the shrubs, many of which are still only known under the collector's numbers, and his experience with them over the years. Following interest after the publication of his book SNOWDROPS AND SNOWFLAKES, he received a large collection of *Galanthus* species from Soviet Russia for comparison and study. I left HIGHDOWN after tea with a present of bulbs of 'Wavell', 'Kenilworth' and 'Firecrest' safely packed in the boot of the car.

One of the more interesting events of the autumn followed the decision by Lady Clarke to auction surplus bulbs from the Borde Hill collection to help with the upkeep of the gardens. Unfortunately too many of the hybrids listed in the sale do not stand up to modern standards, but even so fetched good prices. It is to be hoped that with the great shortage of bulbs of nerine varieties, that purchasers will not be misled into under-estimating the superb qualities of modern nerines, as after all some of the bulbs being sold have been in cultivation for over 70 years and would, of course, be discarded in a modern seedling bed.

However, there were some nice things to be had for the discerning grower. 'Stephanie', one of my favourites, is a really lovely pale pink with smooth petals and very good umbel form. 'Timoshenko' a good strong red. One of the most interesting items, was a cross between *Nerine bowdenii* and *Brunsvigia rosea,* which has small flowers clearly exhibiting the white throat influence of the *Brunsvigia* in the cross. This was listed as "N. BELLADONNA var. MITHRAS", which must not be confused with the Exbury bulb 'Mithras', a pale pink variety with a deeper flushing, as there is no connection in the parentage. One outcome of this auction was the proposal to form a Nerine Society which has since been established as an independent body with Lady Clarke as President.

As we motored through the beautiful heath and woodland of the New Forest towards Exbury, I found it hard to guess what surprises would be flowering for the first time in this great collection. Miss Blackburn greeted me with a twinkle in her eye and sent me off to look for myself while she went to look for Mr. Wood who has been looking after the collection since it was first formed. On arriving at the greenhouse I was greeted by the most fabulous nerine I have ever seen, the twelve flowers were almost 4″ wide on 3″ pedicels and the peduncle was 20″ long carrying an umbel of over 8″ in diameter. One need hardly have looked at the label to know that this was a cross between 'King of the Belgians' x 'Inchmery Kate'. The colour was a pale shell pink with a darker line down the centre of the petals, I could only stand and gaze at it in wonder as it glittered in the autumn sunlight. At last, glancing past, I saw another 'King of the Belgians' seedling, the ice white 'Vestal' sparkling above the other flowers at the end of the greenhouse. 'Carolside', deep salmon and exhibiting a slight tendency to erect pedicels inherited from its mother 'Rotherside'. 'Audrey' a 'Wellington Koo' seedling, rose pink flushed blue, named after Mrs. Wyniatt who now does all the crossing.

Another seedling 'Trafalga' x 'Inchmery Kate' was also flowering but it was difficult to tell how the final flower will look as this was not a typical example, even so the colour was a lovely cerise purple and the petals heavily waved. Of the older hybrids a batch of 'Dunkirk' were especially good. As Exbury have managed to cross this fine triploid with 'Inchmery Kate' it is surely only a matter of time before we will see the first nerine with five times the normal chromosome count.

As luck would have it the winder of my Starteck camera broke after I had taken only one photograph and as all the best flowers were picked by Mrs. Wyniatt the next day to decorate the table for a dinner party being given by Mr. Rothschild, I was unable to get it mended in time to photograph any more of the flowers.

Returning nearer to London a very good collection of modern hybrids has recently been presented to the Royal Horticultural Society by Mr. B. Smithers of Winchester. These bulbs are now growing at Wisley, Surrey, and I am very grateful to Mr. F. P. Knight, V.M.H., Director of the Society's gardens for giving me a complete list of these varieties.

Looking down the list one of the most interesting, 'Wellington Koo,' originated as an unknown seedling at Exbury and was responsible for many of the unusual blue shades which are appearing among the seedlings in that collection. This variety is no longer grown at Exbury and the Wisley bulbs are the only stock that I know of at the moment. Another interesting variety which I have only seen at Bodnant in North Wales is 'Jenny Wren' which is very free flowering, having very characteristic strap-like petals of cherry pink. Good whites are represented by 'Snowflake' and 'Hailstorm' which has flowered well for the last two years.

Any visitor to London in October should certainly try and visit Wisley, as apart from this excellent collection of nerines there is a very wide range of every other type of plant and shrub.

Lastly I am appealing to readers to write to me if they know of the existence of 'Alice' as the original stock has died and I have been unable to locate any enthusiast who is growing this variety at the present.

Graystead, Bovingdon,
Hertfordshire, England

ADVENTURES IN AMARYLLID BREEDING

CLARENCE J. CROCHET, *Route 1, Box 18, Prairieville, La. 70769*

For the past few years we have been hybridizing in several directions. Work with *Amaryllis, Crinum, Zephyranthes, Habranthus,* and *Rhodophiala bifida* and *Spathacea* continues. In the case of some groups, as in *Amaryllis,* the results have been quite satisfactory. In other groups, results are rather disappointing for several reasons. Perhaps the most prominent reason is that so much time will lapse from seed to mature, blooming size bulb. Another is that very often the weather situation is not ideal for the work at hand. Very often frequent rains will not allow pollen to dry in the open and hybridizing will be impossible as a result of this. On the other hand, excessive dryness in the atmosphere or in the soil increases the difficulties encountered by the hybridizer. As a result, hybridizing activity is curtailed. Often flowers which might be worked with on a particular day have deteriorated to the point that they cannot be used. An example of this is *Habranthus.* On very warm, humid days, the small and often fragile flowers last no longer than twenty-four hours. Therefore, one must be constantly alert to the opportunity for hybridizing, when it is presented. In the past, many times, flowers which we had waited to see in bloom completely eluded us because of their small or insignificant size. We have learned that a quick but thorough check of the flower beds every day leaves nothing to chance.

Pollen storing has greatly facilitated the work on our more recent projects. For storing pollen we use small glass vials. These are kept on the top shelf of the refrigerator, tightly closed, and with each vial marked with the name of the pollen parent. Using this procedure has made it possible to keep valuable pollens over a longer period of time.

Amaryllis species acquired from various sources have, as a whole, proved indifferent to our pot culture here. In many cases, they either did not grow and thrive in pots, or have only persisted through several years of effort at trying to provide them with optimum growth conditions. Consequently, we removed said bulbs from the pots early this spring and planted them directly in open beds. The soil in these beds had been improved by the addition of peat moss (Canadian sphagnum) and copious amounts of builders sand (coarse grade). The latter was to be a safeguard against our rainy climate and also a guarantee that the soil around the bulbs would quickly drain. The results were phenomenal. *Amaryllis* which showed no vigor or effort to grow previously have now taken hold and are growing vigorously for the first time. These species and species crosses will be removed and stored for the winter months in paper sacks. Next spring (1967) they will again be planted in open beds. The exception to this will be those bulbs which will bloom before that time. In this event, indoor potting will be necessary. An example of species which require winter potting are *A. striata fulgida,* which is dormant for only short periods. But they also will be planted in open beds early in the spring when the weather permits.

AMARYLLIS HYBRIDS

This group of bulbs presents by far the greatest amount of enjoyment of those mentioned not only because of their great beauty and varied colors, forms, sizes, and generally satisfactory performance, but also for their role in the development of hybrids of breathtaking beauty. The results with this group have been more than satisfactory and gratifying. With the advent of ''pastel'' hues, they are keeping in step with the times, and choices of color in the future will only be a matter of personal taste. At the present time one can see color ranges from the lightest and softest salmons, pinks, light oranges, purest whites, blazing scarlets, large flowered picotees whose edges are marked with fine pink or red lines, to the very darkest shades of red and violet red.

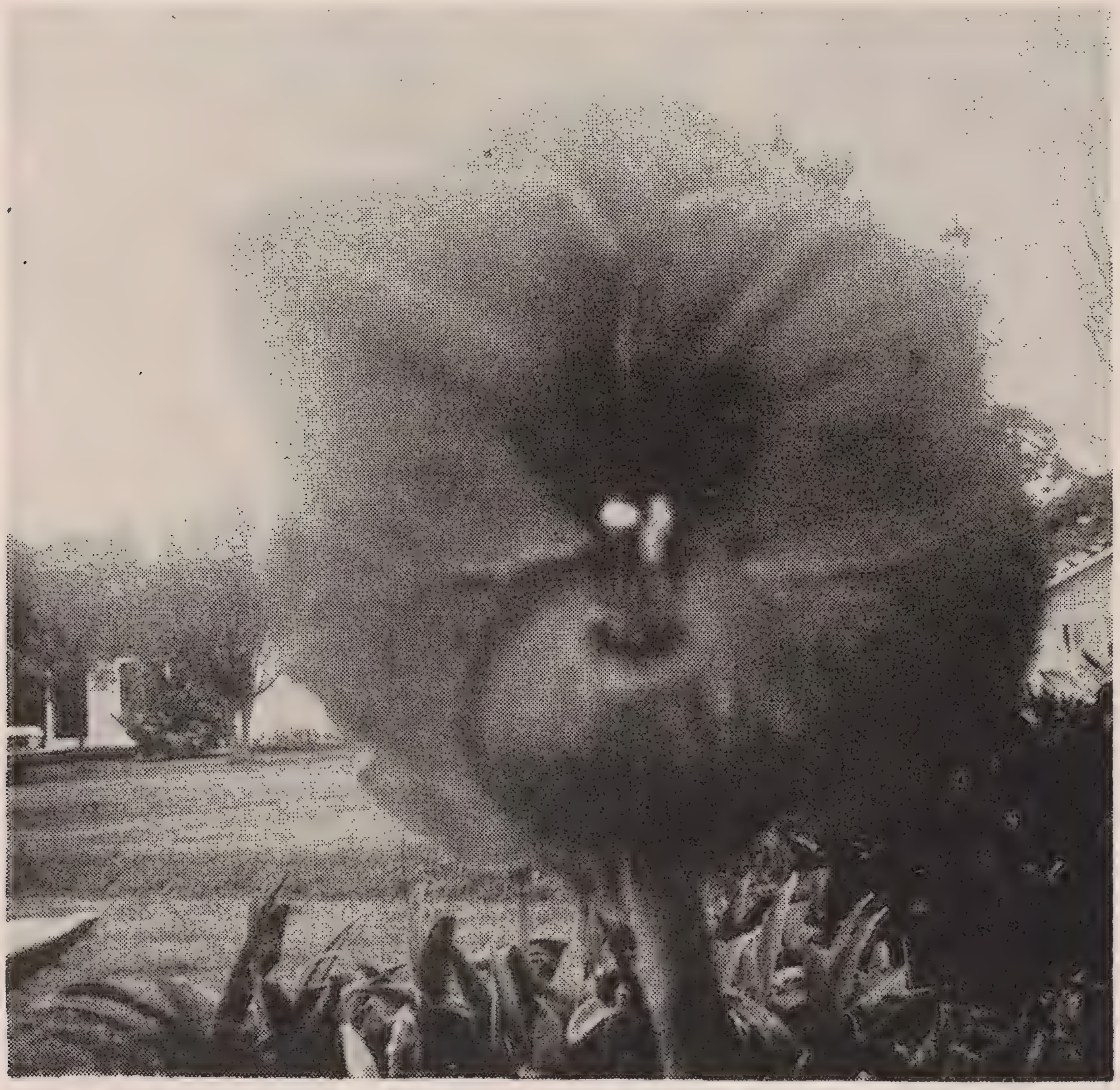

Fig. 40. Hybrid **Amaryllis,** very large red with completely reflexed tepalsegs, giving an almost round appearance, grown by C. J. Crochet.

For the last few years we have been carefully selecting those plants which we deemed to be outstanding in color, form, performance, sunfastness, uniqueness, and hybrid vigor. These individual bulbs have been segregated, numbered, and are being re-evaluated each year. From this group we plan to select, register, and introduce those which we consider outstanding. Outstanding is (1) a large white hybrid with brightest scarlet red ''brushed'' on, and with wide tepalsegs and green throat. The color contrast is most pronounced; (2) a very light salmon ''pastel'' colored flower with whitish throat and very wide floral parts.

This flower is very flat in form and all edges are ruffled; (3) a large white flower with all segments marked with ''eyelashes'' of scarlet red. All segments are also markedly imbricated; (4) a large white flower with all floral parts ''washed'' a light rose color at the tips; (5) a light colored salmon pink with ''seersucker'' texture; and (6) an orange red colored hybrid with very wide pure white band in the middle of all segments.

Our personal choice in amaryllis flower hybrid form has been the very imbricated ''overlapping tepalseg'' type, but even above this we value complete-reflexed tepalsegs, giving an almost round appearance (see Fig. 40). A very large red hybrid, with wide floral parts. An almost completely round form (see Fig. 41). Another oddity which has appeared in our hybrids is the red reflexed but angular form (see Fig. 41), reminding one of a hybiscus flower in full bloom.

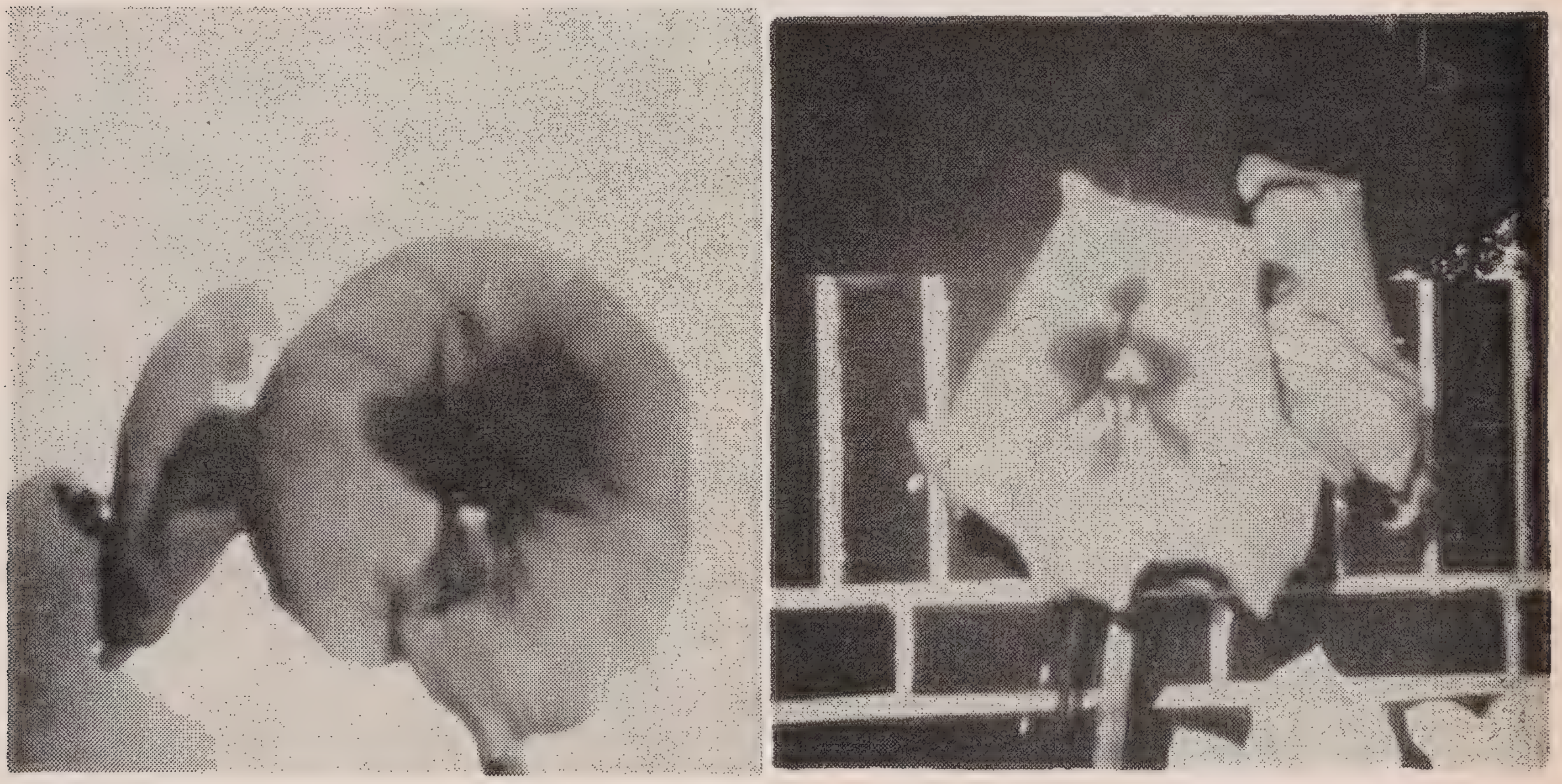

Fig. 41. Hybrid **Amaryllis, left,** large red, almost completely round in form; **right,** showing the red reflexed angular form reminiscent of a **Hibiscus** flower. Grown by C. J. Crochet.

Outstanding are (a) *A. evansiae, A. evansiae* x 'Leading Lady,' a white Dutch hybrid, portraying vividly the contribution of both parents in the resulting hybrid; and (b) the second generation cross of *A. striata fulgida* x 'Five Star General' x 'Sight Show'. The resulting hybrid is of medium size and pink in color, having the short *A. striata* scape height.

CRINUMS

Work with crinums has been somewhat less rewarding than with amaryllis. We do hope however to progress slowly in the future. From many crosses involving *Crinum scabrum* we have selected one seedling which blooms later than the parent bulb and which shows a pink striped keel rather than the ''wine'' red of *scabrum*. Its value is in both its color and blooming period. Figure 42 shows this *Crinum* hybrid in full bloom while the species *Crinum scabrum* is at lower right of the picture. Pollen from the light primrose yellow *Crinum luteolum* has also been used successfully in crosses with *Crinum scabrum* and the resulting seeds have been planted. The outcome of this cross will be awaited with great expectations and interest as we already see in our minds a yellow hybrid *Crinum* with the growing habits of *Crinum scabrum* and with the grace and beauty of *Crinum luteolum.*

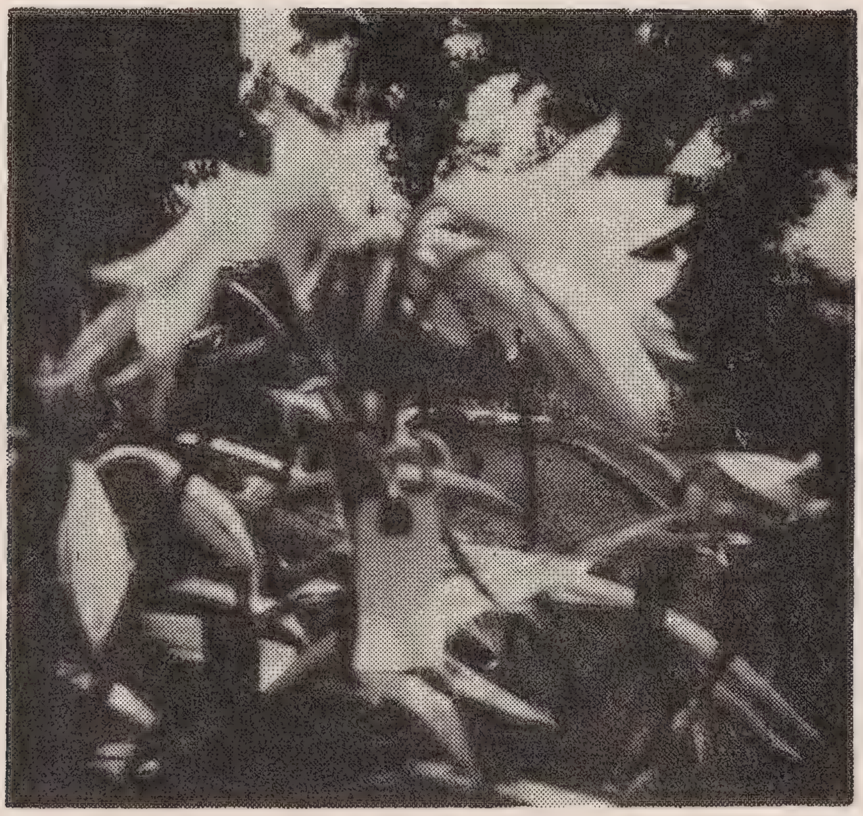

Fig. 42. Wine red hybrid, involving **Crinum scabrum,** grown by C. J. Crochet, Prairieville, Louisiana.

ZEPHYRANTHEAE

In this group of little bulbs which bloom so often we have bloomed two new hybrids. The first of these involved Dr. Howard's "Apricot Queen" and *Z. citrina,* a reliable gold colored clone. The resulting hybrid was about 12 inches high and very dark yellow in color with brown lines on setsegs only. The other hybrid was more striking. It is from a cross of Dr. Howard's "Helen Wyatt" and "Kitty Clint". This cross produced a hybrid of pink color with white star in the center of flower parts. This combination of colors is very pleasing and delicate.

Habranthus and *Zephyranthes* of the subgenus *Cooperia* have also been used in hybridizing but none of the seedlings have bloomed yet. In this group of amaryllids are many interesting species and hybrids from Mrs. Morris Clint, Brownsville, Texas. She very generously added to the writer's collection of this little known and cultivated group of interesting bulbs.

RHODOPHIALA

The two species of *Rhodophiala (spathacea* and *bifida)* have also been used in hybridizing. The objective was to verify the cross *Rhodophiala* x *huntiana* which has been reported. The intermediate color will prove interesting in further hybridizing. From dozens of crosses came a very light pink hybrid as well as a rose colored one. Tepalsegs on the hybrids were wider than usual. The types were to be photographed but unfortunately camera equipment was not available at this time. It is hoped that photographs can be made in the future and reproduced in Herbertia.

CRINUM X EBORACEI—'JUNE HARRIS'

L. S. Hannibal, *4008 Villa Court, Fair Oaks, California 95628*

Presumably about 1825 Dean William Herbert crossed *Crinum asiaticum* with *C. bulbispermum* (Then known as *C. capense album*) to effect his hybrid known as *C.* x *eboracei.* The fact that this hybrid or an allied one of *C. bulbispermum* x *pedunculatum* were free seeders and produced robust F-2 plants was of little significance at the time as little was known concerning the genetics of hybrids. Now it is quite a surprise to find that species from subgenera will cross and give fertile seedlings whereas species in the same subgenera are often quite incompatable.

The second record of *C.* x *eboracei* being produced is by the Reasoner brothers who established and operated the Royal Palms Nursery in Florida beginning some 80 years ago. To them goes much of the credit of intercrossing *C. bulbispermum album* with *C. asiaticum* (or *pedunculatum*), *C. americanum, C. kirkii, C. scabrum,* and *C. amabile.* The fact that most of these hybrids have been accepted as species by later horticulturalists in a fact well worth noting. However, according to the Reasoner catalogues their *C. cappedum* cross was a *pedunculatum* x *bulbispermum album.* L. H. Bailey identified it as *C.* x *eboracei* var. *cappedum.* In August 1966 this hybrid was apparently found. It had been growing in the garden of Ivy Powell. Eventually we will be able to compare it with *eboracei* hybrids as well as *pedunculatum* x *bulbispermum.*

Both the Reasoner and Herbert crosses had white flowers. Some ten years ago Charles Harris of Griffin, Georgia, crossed the *C. bulbispermum roseum* with pink blossoms on *C. asiaticum* (presumably *sinicum*) and obtained several clones of a free flowering pink, the best of which he named *C.* x *eboracei* 'June Harris' for his wife. This hybrid is quite hardy and will backcross to produce seed. The plant is nearly as tall as *C. asiaticum* but the foliage resembles that of a slender growing *Agave* more in shape as it is succulent, semierect and the leaves come to long tapered points. Blossoms may occur from May to October in Georgia. These are on 36 to 40 inch scapes, standing above the foliage and the florets stand erect with slender horizontally spreading tepalsegs. There is some similarity to the hybrid 'Twelve Apostles'. The fragrance is quite spicy. Fortunately the Harris bulb produces numerous offsets so it is possible to obtain a large clump within a few years. The fountain like foliage, numerous flower heads and lack of cluttered dead leaves make this plant an interesting garden subject.

The ability of *C. asiaticum, C. pedunculatum,* and *C. americanum* to cross with *C. bulbispermum* and *bulbispermum* hybrids has caused us to examine related plants. All are vigorous and show some level of fertility. Crosses of *C. asiaticum* and *zeylanicum* have been reported in Calcutta gardens, and crosses between the dwarf Japanese *C. asiaticum* and South African Crinums have been effected by the writer. This group should be particularly hardy. A *C. asiaticum* x *C. americanum* hybrid apparently exists which bears considerable resemblance to a small *C. pedunculatum,* and a *C. americanum* x *C. amabile* was recently found by the late Ira Nelson. There are undoubtedly others but the scant information on unreported hybrids as well as reported gives us little means of evaluating the plants.

TRAUB: AMARYLLID NOTES, 1967—continued from page 69.

Allium canadense subsp. **mobilense** (Regel) Traub & Ownbey, **comb. nov.**, Syn.—**Allium mobilense** Regel, in Acta Horti Petrop. 3: 121. 1875.

Allium canadense subsp. **hyacinthoides** (Bush) Traub & Ownbey, **comb. nov.** Syn.—**Allium hyacinthoides** Bush, in Ann. Rept. Mo. Bot. Gard. 17: 119. 1906.

Allium canadense subsp. **lavendulare** (Bates) Traub & Ownbey, **comb. nov.** Syn.—**Allium lavendulare** Bates, in Am. Bot. 22: 58. 1916.

Allium canadense subsp. **ecristatum** (Jones) Traub & Ownbey, **comb. nov.** Syn.—**Allium reticulatum** var. **ecristatum** M. E. Jones, Contrib. West. Bot. 18: 21. 1935.

Allium canadense subsp. **fraseri** (Ownbey) Traub & Ownbey, **comb. nov.** Syn.—**Allium canadense** var. **fraseri** Ownbey, Res. Stud. State Coll. Wash. 18: 195. 1951.

Allium perdulce subsp. **sperryi** (Ownbey) Traub & Ownbey, **comb. nov.** Syn.—**Allium perdulce** var. **sperryi** Ownbey, Res. Stud. State Coll. Wash. 18: 202. 1951.

Allium geyeri subsp. **tenerum** (Jones) Traub & Ownbey, **comb. nov.** Syn.—**Allium geyeri** var. **tenerum** M. E. Jones, Contrib. West. Bot. 10: 28, fig. 55. 1902.

Allium persimile (Ownbey) Traub & Ownbey, **comb. nov.** Syn.—**Allium tolmiei** var. **persimile** Ownbey, Res. Stud. State Coll. Wash. 18: 29—32. 1951.

Allium cernuum subsp. **obtusum** (Ck11.) Traub & Ownbey, **comb. nov.** Syn.—**Allium cernuum** f. **obtusum** Ck11., in Torr. Bot. Club Bull. 18: 173. 1891.

Allium cernuum subsp. **neomexicanum** (Rydb.) Traub & Ownbey, **comb. nov.** Syn.—**Allium neomexicanum** Rybd., in Torr. Bot. Club Bull. 26: 541. 1899.

Allium nevadense subsp. **cristatum** (S. Wats.) Traub & Ownbey, **comb. nov.** Syn.—**Allium cristatum** S. Wats., in Am. Acad. Arts & Sci. Proc. 14: 232. 1879.

Allium fimbriatum subsp. **purdyi** (Eastw.) Traub & Ownbey, **comb. nov.** Syn.—**Allium purdyi** Eastw. Leaflets West. Bot. 2: 110. 1938.

Allium fimbriatum subsp. **parryi** (S. Wats.) Traub & Ownbey, **comb. nov.** Syn.—**Allium parryi** S. Wats., Proc. Am. Acad. 14: 231. 1879.

Allium fimbriatum subsp. **mohavense** (Tidestr.) Traub & Ownbey, **comb. nov.** Syn.—**Allium mohavense** Tidestr. Proc. Biol. Soc. Wash. 48: 39. 1935.

Allium monticola subsp. **keckii** (Munz) Traub & Ownbey, **comb. nov.** Syn.—**Allium parishii** var. **keckii** Munz, Man. So. Calif. Bot. 87, 597. 1935.

TRAUB—SUBSCETION **MEXICANAE**, continued from page 95.

SECTION **RHOPHETOPRASON**, GENUS **ALLIUM** L.:— Vegetative reproduction in **Allium glandulosum** and **A. kunthii (longifolium)** is so distinct from that of the other Alliums of Subsection **Mexicanae**, Section **Amerallium**, genus **Allium**, L., that it is necessary to group these under the new Section **Rhophetoprason**, in which the current season's bulbs, after flowering (seed setting), produce thick, smooth rhizomes; and the food in the bulbs and rhizomes is **reabsorbed** (leaving vestiges only) and is translocated to form new flowering-sized terminal bulbs.—**Hamilton P. Traub**

4. AMARYLLID CULTURE

[REGIONAL ADAPTATION, SOILS, FERTILIZATION, IRRIGATION, USE IN LANDSCAPE, DISEASE AND INSECT CONTROL, ETC.]

NEW AMARYLLIS SPECIES INTRODUCED

Claude W. Davis

470 Delgado Dr., Baton Rouge, La. 70808

Several new species of Amaryllis have been introduced in the winter of 1965-66 and commercially distributed to interested persons through the cooperation of Dr. Martin Cardenas, Professor and Head of the Department of Botany, Universidad Mayor de San Simon, Cochabamba, Bolivia. These include the following:

A. yungacensis Cardenas and Nelson, which was discovered by the co-authors in the Province of Sud Yungas, Bolivia in 1958. To quote the late Prof. Nelson, ''This is a spectacular species. Its flowers are as large as ordinary American hybrid garden sorts and its colors and color pattern are bold. There is strong contrast between the large, yellow-green throat and the deep red of the outer one-third of the floral segments. The near white margins of the segments give it striking contrast with its surroundings. The coloration on both sides of the floral parts is very similar. The bold stripe along the mid-rib is present only on the inner surface of the segments.

''*Amaryllis yungacensis* appears to be easy to handle in cultivation and should be a fine addition to our pot and garden flowers. Its value as breeding stock is yet unknown, but it has several desirable characteristics.''

In the experience of the writer this species is fertile and it produces viable seed quite readily when the flowers are pollinated with pollen from another clone.

Amaryllis starkii Nelson and Traub, was discovered in 1958 in a location about two miles from Santiago, Bolivia in the foothills of the Serrania de Santiago range of mountains. The bulbs were growing in an area of exposed rock which contained scattered pockets of sand and organic matter. The striking feature of this small flowered species is that the blooms are held upright on the scape. There are from one to three blooms per scape, depending on the age and size of the bulb. The flowers are a ''tomato colored'' pink with white throats. This species crosses readily with *A. belladonna, A. evansiae* and with numerous hybrids. It should be potted in a very porous soil mixture and watered very sparingly while in the dormant state.

Amaryllis umabisana Cardenas, comes from the Province Bilboa in Bolivia. It belongs to the Macropodastrum or Elegans Group, with white, trumpet-shaped flowers about 17 cm long. The bulbs obtained during the winter produced foliage which lasted for several months and then went dormant. Because it is native at a high altitude (2,000 m.)

where the air is cool and dry, it probably will not be well adapted to the low altitude and warm, moist atmosphere of the Gulf Coast Region.

Amaryllis mollevillquensis Cardenas. This species has never flowered in the region surrounding Baton Rouge, Louisiana, but it comes from a high altitude and arid climate from Province Bilboa, near Mollevillque, Bolivia. Each umbel bears 2 to 6 small flowers which are orange-red with a greenish base and a white stripe in the center inside.

Amaryllis forgetii Worsley. This is not a new species as it was originally described in 1912, but thus far it has not become widely distributed in the United States. The flowers present a striking contrast in color, being a chrysanthemum crimson, keeled in the lower half with green. The umbel is 2-flowered. This species is self-sterile, but it has been crossed with *A. yungacensis* and the hybrid seedlings are making a very vigorous growth. Apparently this is a species of easy culture which is well suited to either the greenhouse or to an outdoor planting in regions where the winters are mild.

FORCING AMARYLLIS IN WATER

Prof. Agr. Pier Luigi Arduino, Glornalista Agricola, Scrittore, Candia Lomellina, Via Borgoretto 3, Italy, writes under date of January 8, 1966, about forcing *Amaryllis* bulbs in water culture. Those interested should write directly to Prof. Arduino.

EXPERIENCES WITH AMARYLLIS 'SENORITA'

Keith Brown,

4706 Jason, Apt. 131, Dallas, Texas 75206

Many growers shy away from *Amaryllis* species and simple species hybrids because they feel that such are likely to be difficult to grow and relatively unrewarding in bloom. However, 'Senorita', a hybrid of *A. evansiae* x *A. striata,* for me is very easy to grow and has striking flowers. The florets are borne two per scape and in shape very much resemble the photograph of *A. striata* published on page 128 of the 1965 *Yearbook.* What really makes them remarkable is the color. Prof. Davis, the originator, describes the coloration as "pink changing to soft pink as the flower ages, with a chartreuse star in the throat." To me, this description does not do them justice; my clone is a very wonderful blend of light cream yellow and pastel pink, the cream yellow becoming greenish in the throat. I know of no way to adequately describe it. A person must actually see the flower in order to have a good notion of what it really looks like.

My clone blooms freely from small bulbs. Large numbers of off-sets are produced, and often grow to blooming size within two years. The plants seem to prosper both indoors in a sunny window and in outdoor culture in large containers. Presently I am an apartment dweller with only a limited amount of indoor space and a small patio, but I am looking forward to the day when I can have a whole bed devoted to 'Senorita' and other similar *Amaryllis.*

There is only one thing about 'Senorita' that is really disappointing—I have not been able to set seed using it either as a seed or pollen parent. However, I will keep trying until either I am successful or I become convinced that the clone is hopelessly sterile. In the meantime, I have ordered seed of other *A. striata* hybrids. I am grateful to 'Senorita' for introducing me to species hybrids; I recommend it to you.

ACCELERATING BLOOMING FROM SEEDS IN AMARYLLIS WITH BOTTOM HEAT

J. L. DORAN,
1117 N. Beachwood Dr., Burbank, Calif. 91502

About two years ago I received some *Amaryllis* seed which I believed was quite interesting and worthy of special effort. Upon making inquiry about methods for accelerating growth and obtaining bloom sooner, I was told that heat would help, but nothing would make them flower in a year. However, I decided to try. A box was made about twelve inches wide, 33-½ inches long by eight inches deep. A one-quarter inch diameter stainless steel tube was placed about one and a half inches above the bottom and three inches in from the side and running the long way of the box. The tube ran through the box at each end, thus supporting itself. A 25-watt heating element was put in each tube, controlled by a thermostat, which was put in the middle of the forward wall of the box. Three sixteenths diameter by 9-inch aluminum rods were placed across the stainless steel tubes one inch apart to distribute the heat evenly. The box was filled with fine sand. Twenty-one three month old sceedlings were planted three and a half inches apart in the box. The thermostat was set to hold ninety degrees one-inch above the rods. The box was watered when needed until bulbs recovered from transplanting shock, then watered twice a week with a solution of one hundred p.p.m. each of N, P_2O_5, and K_2O. These elements were supplied from ammonium nitrate, di-hydrogen ammonium phosphate, and potassium sulphate. A year from the time the seed was planted, the bulbs touched each other. The *first bloom* appeared *fourteen months* from time of seed planting. One bulb had four scapes with a total of seventeen large flowers in twenty months. About one half of the bulbs flowered in two years. All had large off-sets. The box was maintained in a greenhouse that was heated to maintain a night temperature of sixty degrees and went as high as a hundred on summer days.

I believe that if the seeds had been planted directly in the box with bottom heat, the objective to obtain flowering size of all of the seedlings within a year and a half and at most two years, might have been achieved. This will be checked in a later experiment. On the whole the experiment was very much worth while, and it is hoped that others will report on similar experiments.

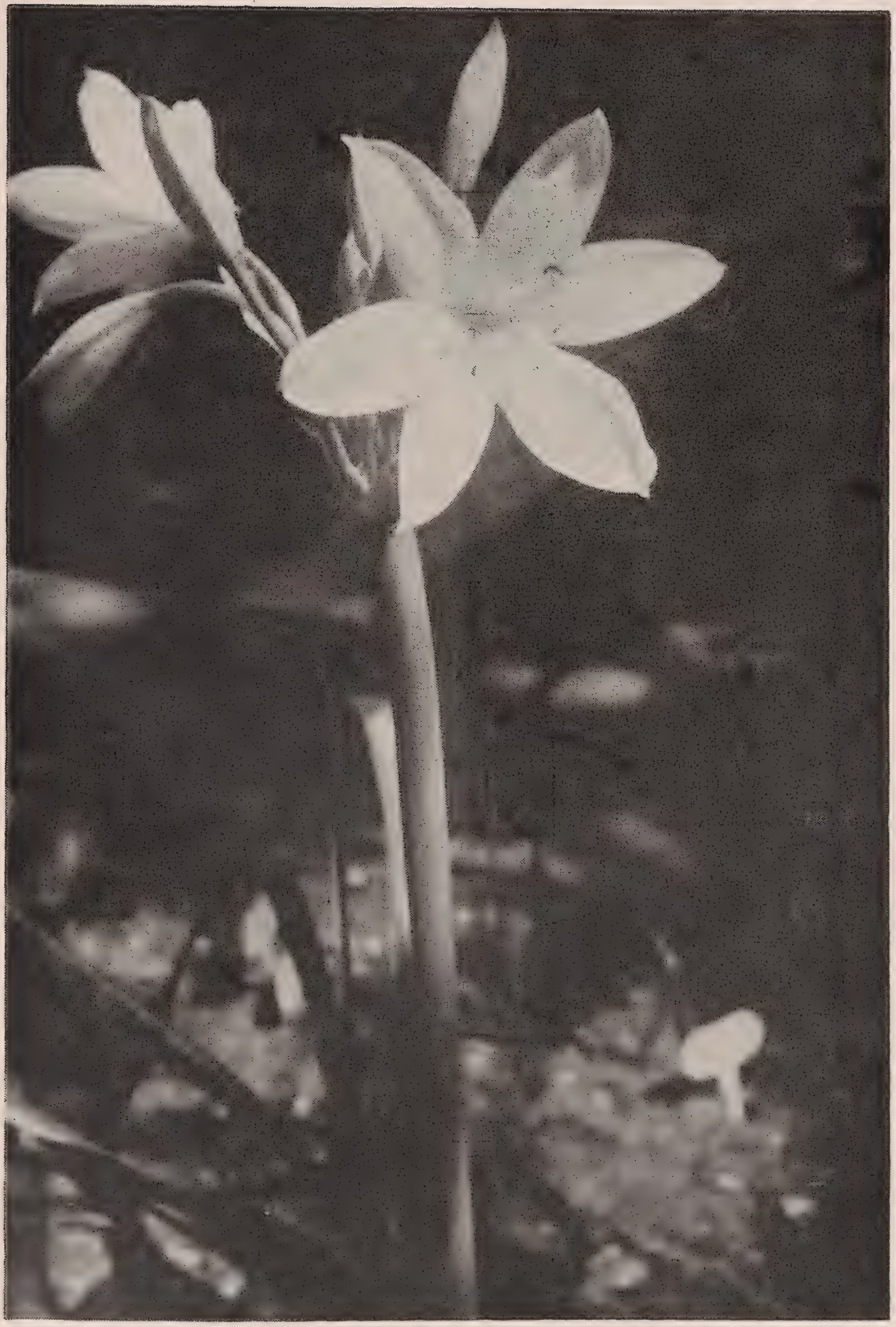

Fig. 43. **Crinum luteolum** Traub & Hannibal as grown in Mrs. Morris Clint's garden, Brownsville, Texas, June 1965. Photo by Mrs. Morris Clint.

CRINUM LUTEOLUM IN SOUTH TEXAS

MRS. MORRIS CLINT, *Texas*

About August 20, 1961 Mr. William Morris of Australia sent us a small bulb of the rare, yellow-flowered *Crinum* native to the area near Port Augusta, South Australia, which was later to be named *Crinum luteolum* (see Plant Life 22: 46. 1966). It was planted in a tall juice can and placed on one of the benches in our semi-shaded patio, where it grew very nicely. The severe freeze of January 9-12, 1962 came in sooner and much colder than predicted and the bulb went through at least 8 hours of sub-freezing temperature. It looked a little wilted, but fortunately soon recovered in the warmth of the greenhouse. The winter of 1962-63 was another cold one, so it was not planted in the ground until late in the spring of 1963. Bill Morris had written that the general habitat of this *Crinum* was semi-desert with an annual rainfall of less than 10″, so it was planted on a slope in a well-drained bed of sandy loam soil where it received full morning sun, very light afternoon shade and less than average watering. The bulb grew very slowly but seemed happy enough, so we stopped worrying about it and prepared to wait quite a while for it to bloom.

Needless to say, we were surprised and pleased to discover a scape early in June of 1965. We were even more pleased when the first lovely yellow flower opened on June 9th. The remaining 10 buds opened in pairs on successive days and, since each flower remained fresh well into the third day, there was soon quite a bouquet. A second scape carried 9 blossoms and started flowering about 2½ weeks later. Although we carefully hand-pollinated every flower, only a single seed was obtained. During the entire blooming period the weather was hot, dry and very windy, with abnormally low humidity but the flowers remained fresh and the scape upright. This is most unusual in our climate, for here very few Crinums last a full day and many open so late in the evening and droop so early in the morning that we never get to see them fully open at all. In addition, most of the scrapes must be heavily staked to keep them from falling to the ground.

The winter of 1965-66 was fairly mild with fall, winter and spring moisture well over normal and the bulb remained evergreen all winter. So far this year (July 3), the bulb has produced 3 scapes. The first one, which started blooming on June 4th, had 17 flowers; the second one, with 16 blooms, opened its first flowers on June 18th; the third, with 14. a few days later. Although we were not able to pollinate but a few flowers, seed production looks more promising. The plant is well foliaged, but still rather small—so small that one wonders how the bulb can support 3 such large, robust scapes (about 20-22″ tall) with so many flowers.

Blooming conditions this year were radically different from those of 1965. Except for the first 10 days, when it was hot, still and sultry, it has been cool and humid, with almost no wind. It showered lightly on June 7th, rained heavily on the 13th and 14th and continued daily showers for over two weeks gave us almost 6″ for the period.

We would place this species close to the top of the *Crinum* list for our area. It seems to thrive under almost any weather conditions and requires little or no care; the blooms are large, gracefully beautiful and very long lasting. The color here is Dresden Yellow 602/2 on opening (which is usually before 4 P.M.), fading to 602/1 the next day. The flower is about 4-5″ in diameter at natural expansion, heavy and waxy in texture, with segments from 1 to 1⅛″ broad, and 2½″ or more in length.

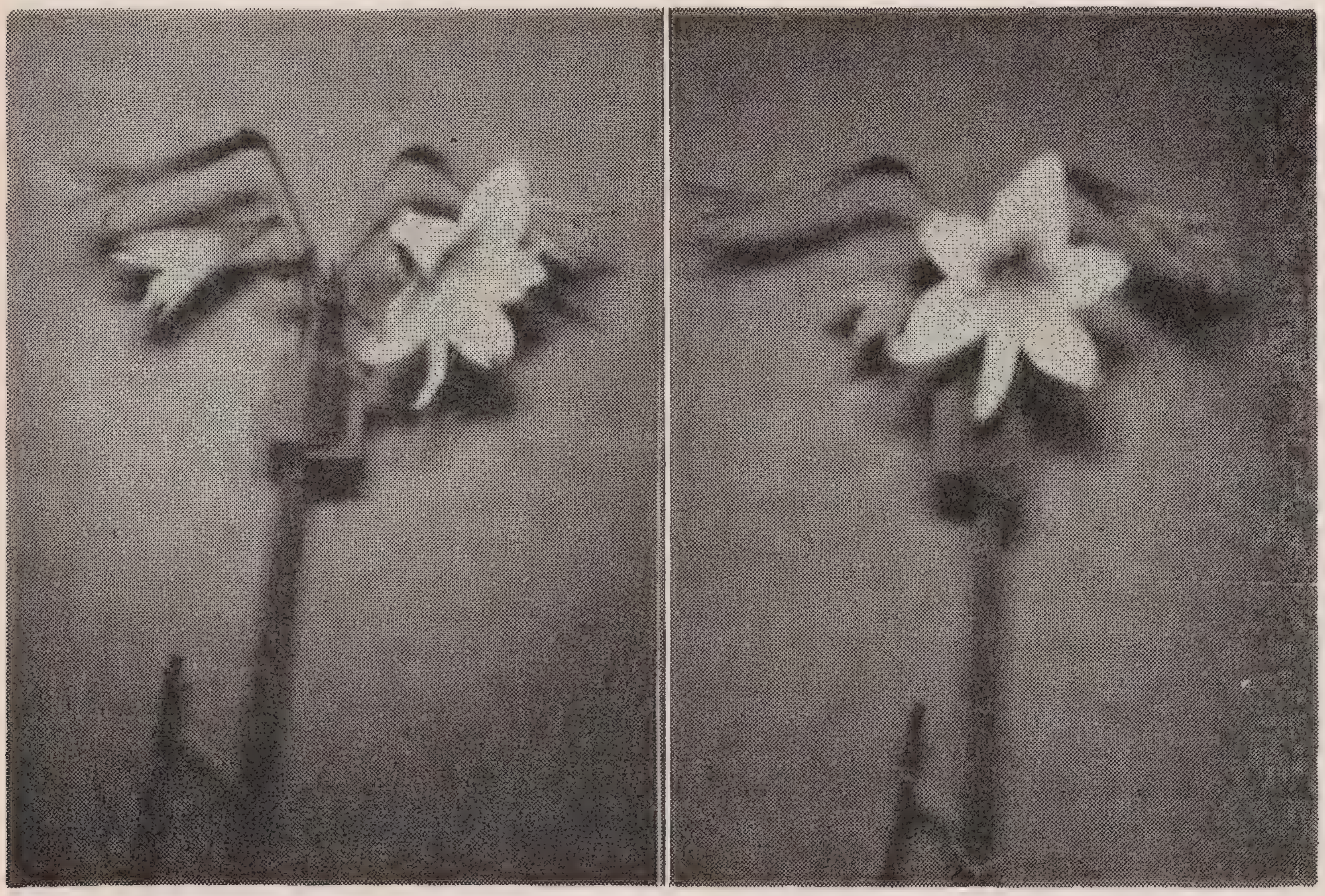

Fig. 44. Unidentified **Amaryllis** as grown by Burr Clouette, Columbia, South Carolina, 1966. See text for further details.

NOTES ON AMARYLLID CULTURE

Burr Clouette, *South Carolina*

AMARYLLIS

In 1962, I ordered some *Amaryllis* bulbs from Mrs. Barry of Pairieville, Louisiana. As one of the extras she sent a small bulb labeled *Amaryllis divifrancisci* Cardenas. She indicated that it was difficult. Her instructions were that it be potted in a very porous, gritty mixture; water was to be sparingly applied, and that it be allowed to go dormant if growth declined. However, as shown in Fig. 44, this is not the typical *A. divifrancisci* as figured in Fig. 11, page 34 of the 1960 Amaryllis Year Book.

I potted it in a mixture of half "Black Magic" and half coarse decomposed granite. It started to grow, and it was regularly but cautiously watered, and fertilized with fish emulsion at regular intervals. It grew until early winter when it became dormant, and remained so for five months. When growth resumed, it increased slowly in size, and made a few offsets. During the winter of 1963-64 it had another long dormancy similar to the one of the previous season. The same regular watering fertilizing was followed during each growing season. As it increased in size it formed more offsets, and all were moved to larger pots as necessary. When it went dormant in 1965, I removed the remaining offsets (three in number), and potted the parent bulb in a five-inch azalea pot.

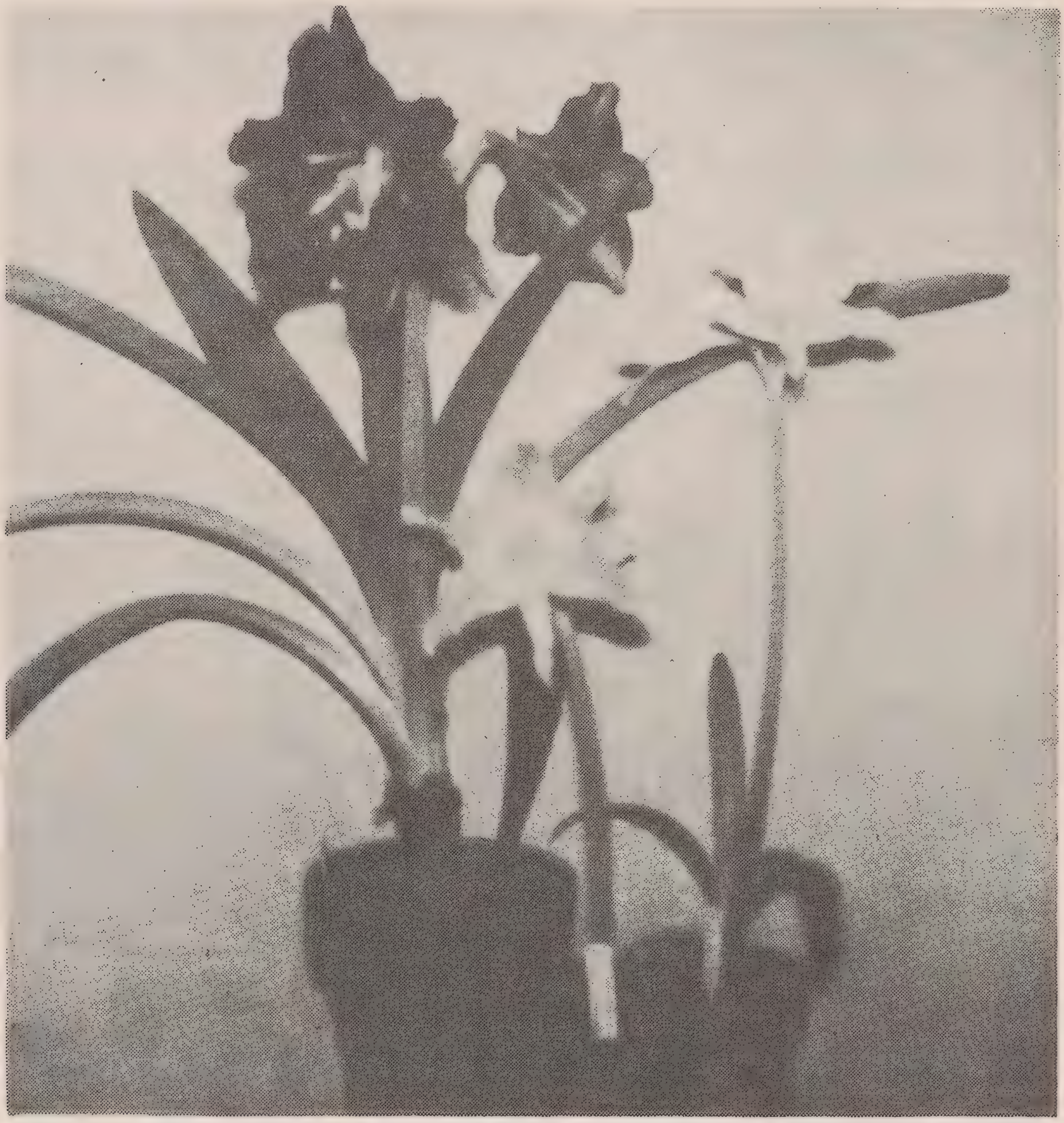

Fig. 45. Three **Amaryllis:** from left to right, the clone 'Cuenca', **Amaryllis belladonna (equestre)** x **A. evansiae**, and **A. evansiae**, 1966.

Just after the turn of the New Year, a bud started to emerge from the dormant bulb. The first week in February, the scape was 14 inches tall, and the first of the four buds opened. The buds were in two sets.

Two opening a few days apart, and the other two did not open until nearly two weeks later. The flowers were good keepers, lasting over a week in the house under fluorescent lights. As they bloomed under such lights in the house, my description of the color may not agree with that of blooms produced outdoors.

The buds were greenish, becoming yellowish-greenish as they matured. The open flower was quite yellow (Nickerson color fan, 7.5Y 9/8), faintly brushed purplish-red; throat green; style and filaments green below, whitish above; pollen yellow; stigma only slightly trifid. The stigma and anthers were exserted beyond the face of the open flower. The flowers were approx. 3 inches in diameter and 2 inches deep, round, flat-faced at maturity, although they were quite conical at first. The 3 widest tepalsegs were over an inch wide; two were less than, and the bottom one only half an inch wide.

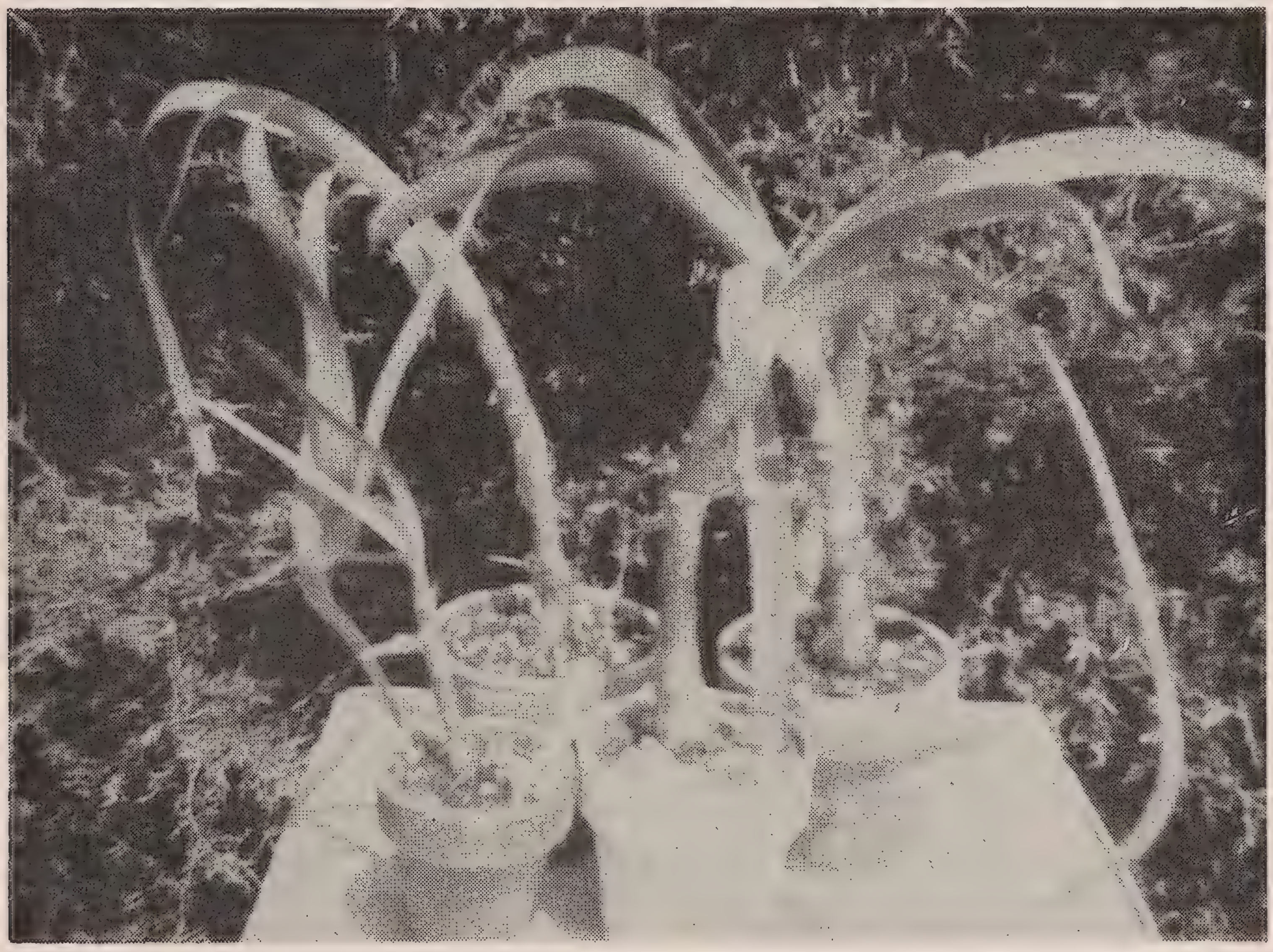

Fig. 46. **Worsleya rayneri** seedlings as grown by Mr. Burr Clouette, Columbia, South Carolina, 1966. Two year old seedlings, the small one in front is of same age as two larger ones in rear; the one in plastic pot, two years old, is from Hummels.

I have selfed the unidentified *Amaryllis,* and have used pollen of the yellow Davis hybrid on it, but do not know as yet if seed is forming. I am also using its pollen on most of my other *Amaryllis* as they bloom hoping for something interesting in the hybrids.

A bulb of Goedert's SA 62-4 bloomed in January-February, 1966. It is apparently a form of *Amaryllis belladonna L.* The flowers were a clear tomato red with greenish-yellowish throat.

Among the other *Amaryllis* that bloomed in 1966, the clone 'Cuenca', an *A. belladonna* x *A. evansiae* cross, and *A. evansiae* were notable. These are shown in Fig. 45.

WORSLEYA RAYNERI

Some progress can be reported with the growing of *Worsleya rayneri* from seeds. As shown in Fig. 46. The seedlings have now reached the age of two years, and are assuming their characteristic form.

AMARYLLID NOTES FROM FLORIDA, SEASON 1965-66

MRS. FRED TEBBEN,
Box 12, Lake Hamilton, Florida, 33851

Here in Florida the blooming season for *Amaryllis* and other members of that family is a long one. Buds began appearing in late February and the first outdoor bloom opened on March 11th, and continued for two months, on up till about May 10th. Before the amaryllis were done with their lovely bloom, the daylilies started, and now the crinums are lovely and the early blooming daylilies are starting in to give their second display of flowers.

In late January we had a very severe cold spell, with the temperature going way down in the low twenties, but it lasted only one night and while much damage was done to tender tropicals, no harm came to the citrus groves as in 1962. *Crinum* foliage was frozen down, and a few red spots appeared on amaryllis leaves, but no permanent injury to anything.

For the first time since moving to Florida my seedling bed of amaryllis bulbs put up a wonderful show for me. Some of these seedling bulbs are very old for I have babied them along for many years, growing them in beds up in Illinois for the very short growing season there and resting them bare-rooted over winter. They have been in the soil here since November, 1961, and this is their first season of bloom. Many were very lovely and just as good in every way as the so called Dutch clones. All my markers have disappeared in that time and it is rather frustrating not to know just who made these crosses and what their parent bulbs were. A few proved not to be very good but all my neighbors wanted them so I gave away many of the reds that I felt were not worth keeping or were duplicates, and that made room for more of the better ones. There was one just like ''Silver Lining'', a pure lovely rose pink, a number of really good salmon pinks, some with white center that were especially pleasing, some whites with stripings of red and some with red dots sprinkled over the white, but all very pleasing to me after waiting so long for their bloom.

Among my Dutch bulbs some have disappeared from that bed and I can only conclude that I have lost them, so will stick to the ones that seem to do so well in the borders here. 'Apple Blossom' is outstanding, as are most of the whites. 'Beacon' bloomed nicely, and 'Pink Favorite' was lovely, 'House of Orange' gave a fine display for it had twelve blooms all open at once, a real bouquet in itself. 'Royal Dutch' was nice and so was 'Rose Queen'. I was given four nice new pinks and they are indeed fine ones. 'Queen of the Pinks' was a nice deep rose with darker center, 'Flora Queen' was a much lighter pink, in fact the lightest of the pinks I have, 'Sight Show' a nice rose pink, but 'Dutch Belle' failed to send up a bud stalk this year. Among those I seem to have lost are 'Delilah', 'Fantasy', 'Purple Queen', 'Pinkster Flower' and 'Bouquet'.

Among the crinums blooming are 'Ellen Bosanquet', one of my favorites, the CHRISTOPHER LILY (*Crinum giganteum* hybrid), which is so fragrant and like a cluster of white tulips in bloom, and Crinodonna 'Fred Howard'. All these are very nice. I like 'Louis Bosanquet' also but it offsets so rapidly it is hard to control. *Crinum scabrum* and several other "Milk and Wine" varieties are also in bloom. *Zephyranthes seem* to disappear from the garden but the two *Habranthus* species *robustus* and *brachyandrus,* seem to do well and multiply rapidly.

Daylilies are gaining very rapidly in popularity in Florida, and the evergreen varieties make nice landscape subjects, though the deciduous ones do well here too, since we seem to have enough cold weather to make them go dormant. There is a daylily grower near here who specializes in the Wheeler hybrids and I visited his garden one Sunday when many lovely ones were in bloom, but no one was there to sell them that day so I will go again.

My husband passed away quite suddenly on April 14, 1965. It has, of course, been a very great blow to me since he had such a short time to enjoy his retirement, and I was at a loss to know just what I should do alone in Florida. But I have fine neighbors and friends, and with my garden to care for, and a few other hobbies such as reading and knitting, I manage to make a life for myself, even though I am very lonely without him.

CRINUM CULTURE IN MARYLAND—FURTHER NOTES

WILLIAM W. ZORBACH

Success in the wintering over of hardy crinums in this area has been maintained now for seven years; previous reports have been given in Plant Life, *19,* 101 (1963) and *21,* 145-148 (1965).

The large clumps produced by *C.* 'Cecil Houdyshel' and *C.* 'Ellen Bosanquet' were dug and separated in the spring of 1965. The bulbs of the latter were planted individually in the raised bed along the east wall of the house, whereas those of *C.* 'Cecil Houdyshel' were planted in clump fashion in a newly prepared, small bed containing sandy soil some eight feet away from the southeast corner of the house. In this relatively unprotected location, the latter bulbs easily survived the winter, despite a blizzard in late January of 1966, which dumped nearly 30 inches of snow in the writer's back yard. Accompanying the snowfall was a severe cold spell which persisted for many days.

The spring which followed was very late; nevertheless, during the first warming, the three subject crinums pushed up readily. Before growth had advanced, the individual bulbs were fed in a manner similar to that for trees. Around each, several holes were poked into the soil to a depth of 12 inches, and were packed with Bovung. This treatment proved to be most salutory, for the performance of the crinums this year was the best to date. Not only was leaf growth more luxuriant, but there was an increase in the number of scapes, some appearing even from relatively small offsets.

C. scabrum is definitely unsuitable as a hardy plant in this area. A single, blooming-size bulb was secured early in the summer of 1964, and was planted 6 inches deep along the (warm) east wall of the house. Shortly thereafter, it bloomed weakly, but took most of the summer to establish itself. When the frosts arrived, it was covered, but during the following spring its leaf stalk emerged long after those of the other hardy crinums. Nevertheless, it made excellent leaf growth during the summer without blooming. It was also noted that, in sharp contrast to *C. powellii album*, 'Cecil Houdyshel', and 'Ellen Bosanquet', the leaf stalk of *C. scabrum* ''kills back'' to a greater depth during the winter months. In fact, it is this circumstance and not the hardiness of the bulb *per se* which militates against the wintering over of this species. Because of the very long delay this year (1966) in the arrival of warm weather, rotting had continued downward, destroying the inside of the bulb. At the same time, the exterior segments of the bulb were intact.

It was reported previously that, with proper protection, *C. asiaticum* would withstand Washington winters. For such treatment, the winters should be mild and, more important, the advent of warm weather should be early to late March, for example. But during the past few years, these conditions have not, alas, been observed. During late March and much of April, there has been an alternation of warming and freezing periods. which has proved to be a hardship even for the hardy crinums grown here.

Thus, the long delays in the arrival of permanently warm weather make it difficult for *C. asiaticum* to regain its strength each year and, because growth is so slow in this species, recovery is not adequate for the production of blooms before the frosts occur in the fall. Accordingly, the small specimen planted permanently outdoors in 1962 was dug, and is now handled as a tender bulb.

In June of 1964, two magnificent specimens of *C. asiaticum* were secured from Wyndham Hayward, each measuring nearly 4 inches in diameter. These were planted immediately in a small bed of sandy soil. Each bloomed shortly thereafter; however, the blooms were somewhat weak due to lack of establishment. This species sets seeds extremely readily, and seven of the ones produced by the new bulbs were allowed to ripen. All seven germinated in a small pot containing sand and vermiculite, although the gestation period was, on the average, five months. The seedlings were planted together in a large pot and were carried over this way in a newly constructed conservatory (electrically heated) abutting the south side of the writer's home. They were planted out in the open soil this summer (1966) and will be treated as tender bulbs.

With the knowledge that *C. asiaticum* does not winter over satisfactorily, the two new specimens were dug prior to the first killing frost in the fall of 1964 and, after trimming, were laid aside until December. They were then planted about 3 inches deep in 16-inch redwood tubs containing very sandy soil, with much bonemeal added, and brought into the conservatory to afford maximum light. Growth was slow, but steady, and in early May the tubs were brought outside in full sun. The two crinums were well watered and fed periodically with Ra-pid-gro. Growth was excellent, and by September 1, each had produced one scape. They were returned to the conservatory in late October, and from that date until May of this year (1966), when they were brought outdoors again, each produced four scapes, providing almost a continuous bloom during the winter months. This summer, growth has been excellent, and the bulbs are now five inches in diameter. In fact, the root systems have proliferated so much that the soil level in each tub has been elevated one inch. At this writing (Sept. 1966), the second ones are about ready to bloom.

Crinum bulbispermum has wintered over with ease, and this summer, one of the two specimens bloomed, albeit weakly. Although perfectly hardy, its performance does not match that of the other hardy species grown here. It appears that its growing conditions are quite different, and, whether this be a function of the soil, amount of water, or sunlight, or a combination of all three has not been determined. Additional experimentation with this species is envisaged.

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UNGERNIA CULTIVATED IN THE UNITED STATES

Burr Clouette, *5225 Spalding,*
Columbia, South Carolina 29203

Recently my good friend, Prof. A. A. Samuelson of Richard, Washington, a *Delphinium* and *Amaryllis* enthusiast, sent me a bulb of *Ungernia*, species of which have probably not been cultivated previously in the United States. He had received several bulbs from a friend in Albuquerque, New Mexico, who is collecting, importing and growing plants from the U. S. S. R. The *Ungernia* species came from the Steppes of Kirghis. He also sent an illustration (Fig. 47) and a description in Russian. Mr. Aleck Korsakoff kindly translated these descriptive notes by N. Sikura as follows:

Ungernia (probably *U. ferganica* Vvedensky, 1935) has been grown in the Central Republic's Botanical Garden for the past three years. The attractive oppositely arranged leaves appear in early April, but by mid-June they dry up, and about a month later, the leafless plant produces a compressed scape with a one-sided umbel of rosy flowers, resembling some other amaryllids. Flowers continue to open for about three weeks and single flowers last from 8 to 10 days. In culture the height of the plant and size of the flowers increase about three times; the height of the scape reaching 55 cm.

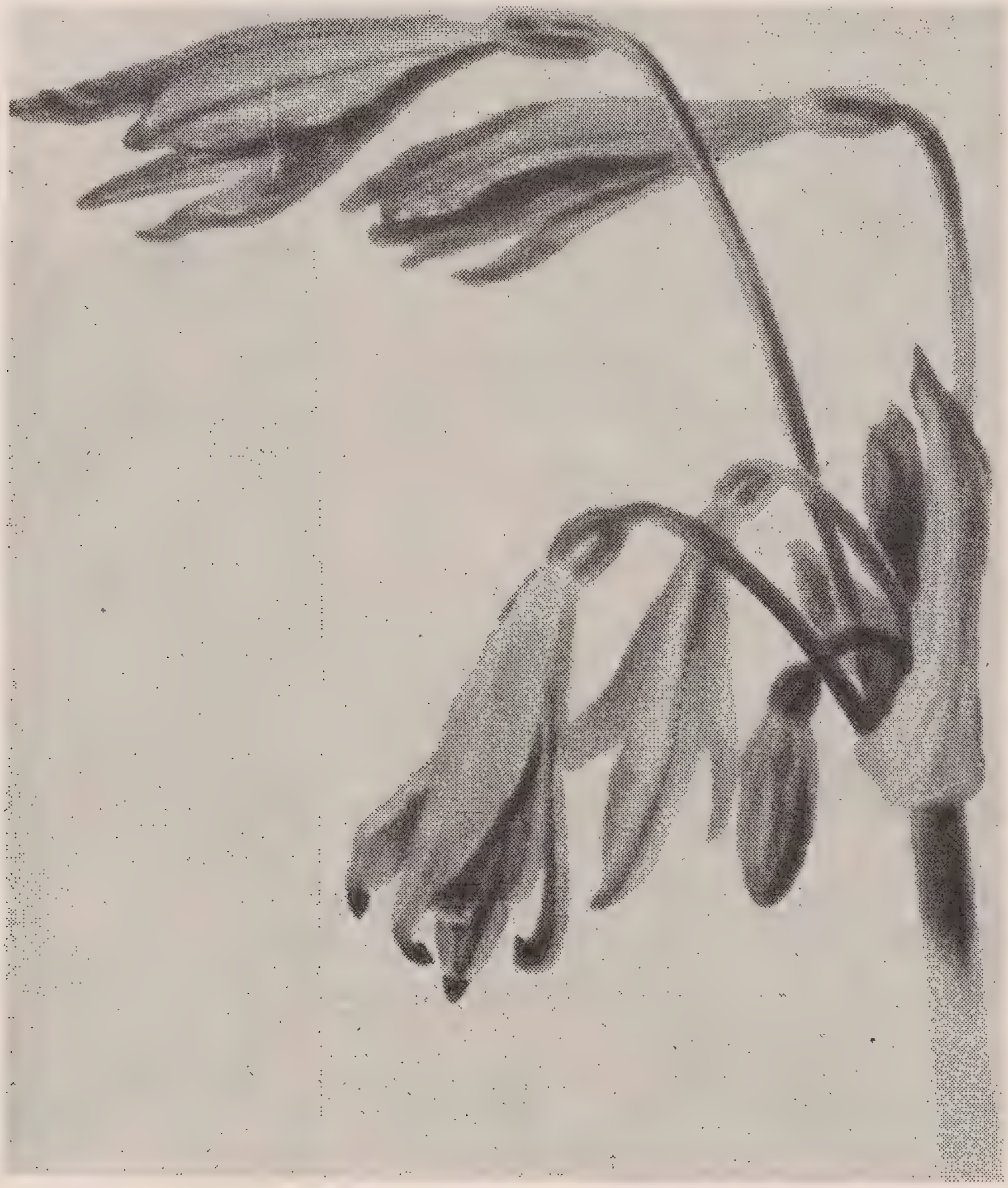

Fig. 47. **Ungernia** sp. (probably **U. ferganica** Vvedensky, 1935). Drawing by A. Pirozhenko.

Ungernia increases easily by splitting of the bulbs, which are cut into four parts. In about a month bulblets form on the cut parts which gradually grow into mature plants.

Bulbs are best planted in the fall. If planted in the spring, blooms will be delayed for one year.

Ungernia is a plant with few requirements; when growing on the Steppes, they do not require watering, and get along with the natural rainfall. In the Botanical Garden we multiply the plants and when large enough, they are passed on to the nurseryman.—N. Sikura (translated by Aleck Korsakoff)

Traub & Moldenke, in ''Amaryllidaceae: Tribe Amarylleae'' (1949) reviewed the genus *Ungernia* Bunge. The reader should refer to this review for further information.

DAYLILY REPORT 1966

W. Quinn Buck, *Chairman, Daylily Committee,*
American Plant Life Society

The 1966 season was marked by the blooming in our garden of some fine new daylilies, both tetraploid and diploid. Perhaps the most exciting new diploids should include 'Jewel Case' (Lester), 'Porcelain Doll' (Lester), 'Beauty Pageant' (Fay), 'Prairie Thistle' (Marsh), and 'Prairie Chief' (Marsh).

Mrs. Hugh Lester's 'Jewel Case' proved to be an amazingly beautiful combination of a bright green throat blending into a mixture of cream and clear pink for petal and sepal color, set off by a lavender midrib: it seems a sort of pinnacle for this type of flower, of which there have been some very fine ones in recent years. Its wonderful shape, substance, and finish were enhanced by vigorous growth and excellent reblooming characteristics.

'Porcelain Doll' was an equally delightful small pink-and-salmon cream bicolor, round, flat, and of wonderful finish and substance. 'Carita' (Lester) did not appear happy in California this year, although it was reported as being extremely good on the East Coast.

Orville W. Fay's 'Beauty Pageant' was a most outstanding new large pink flowered daylily this year; it is wonderfully clean and bright in its color, which contains no salmon and is quite different from Mr. Fay's other pinks. Incredible branching and the size of the flowers made the slender spikes bend a little too much, although this may have been aggravated by the amount of shade from the nearby walnut tree. 'Grace Lenington' (Lenington) as a second-year plant had improved amazingly, being a huge lavender-pink of spectacular quality. Miss Spalding's 'Pink Fluff', 'Zadol,' and 'Lissy' again were among the most pleasant of the clear, bright pinks; 'Pink Fluff' was an especially fine performer, with rounded, nicely shaped flowers.

'Prairie Thistle' (Marsh) was an agreeable addition to the clear lavenders, having no hint of muddiness and being unaffected by our difficult climate; its flat shape had a bit of perkiness because of the spacing of segments. 'Lavender Flight' (Spalding) remained the finest of the lavenders, for clear color, good shape, and smooth finish; its spikes did try to grow too tall this year.

'Prairie Chief' (Marsh) was a remarkably clear dark red that makes one wish to see it again and again in order to find out if it can remain so good in this climate. It had much of the quality of the Claar reds as grown in the East, none of the latest of which have been tried here yet.

Among the tetraploids 'Dazzler Gold' (Childs) did not show as much of its 'Cartwheels' parent as one would have liked. Neither 'Cathedral Bells' (Childs) nor 'Tetra Edna Spalding' had very good color this year, our climate having given them a heavy infusion of muddy salmon to mar the pink. Undoubtedly all three of these clones should improve as the plants get stronger.

Mr. Fay added two more fine tetraploids to his releases in 1966: 'Lady Cynthia' (Fay T63-24, illustrated in Fig. 30 on page 115 of the 1965 *Plant Life*), a pale melon sister of the cream 'Kathleen Elsie Randall' released in 1965, and 'Gertrude Smith', which made such a sensation when it first opened its huge ''pongee pink'' blooms in Mr. Fay's field, and which he still considers the finest of his cross of 'Crestwood Lucy' X 'Crestwood Ann'. These Fay tetraploids undoubtedly will prove to be wonderful breeding material.

A visit to Dr. Hamilton P. Traub's garden in La Jolla, California, made it possible to see just a few of his newest seedlings. 'Red Butterfly' was a huge flower of very pleasant rose and red tones and of very good shape and finish; the spike was a reasonably good height and in scale. Some of the yellow and gold butterfly-type seedlings tended to be too tall still, as did the lavender and purple seedlings; however, a good percentage are the desired medium height. One of the most outstanding breaks in the Traub garden was a truly everblooming seedling yellow which should be invaluable in giving many everblooming seedlings in this strain.

In the Buck garden the most interesting new tetraploid seedlings as a group were the offspring of 'Tetra Marsha, Russell' some being very fine round ffowers. The beautiful 'Tetra George Cunningham' produced a good seed crop in combinations with other fine varieties, and 'Tetra Quincy' also gave more viable seed. Among treated plants that bloomed for the first time this year were 'Frances Fay,' 'Hilarity,' and the important and beautiful 'Blue Jay,' which should give many interesting crosses from the late fall blooming.

THE MILK AND WINE LILY CONFUSION

L. S. Hannibal, *Fair Oaks, Calif. 95628*

For some years the writer has been trying to unsnarl the overlapping nomenclature of the hardier Florida Crinum types which are commonly rated as the ''Milk and Wine Lilies.'' The first suspicion that some of the presumably valid species were actually hybrids came when several clones were found to be pollen sterile. Then with the importation of true species numerous irregularities became apparent. The final confirmation came when the writer examined a number of old garden catalogues dating from 1885 to 1910. Evidence of hybrid introductions, misnaming, and early confusion became apparent from the start.

In short all of the central African species cross readily with *Crinum bulbispermum album*, which includes *C. kirkii, distichum, yuccaeflorum, sanderianum, scabrum, fimbriatulum, giganteum* (*Jagus* Thompson; recognized name in Hortus III) and others. These tropicals when hybridized with *bulbispermum album* tend to blend their characteristics by yielding foliage something like *C.* x *powelli album*, trumpet flowers with a light red or pink keeling to the tepals, deep growing bulbs and a fair resistance to wet or cold winters. Some hybrids are fertile to the extent that they produce viable pollen, others are pollen sterile. Sometimes sufficient features show up to make it possible to identify the missing parent. In several instances the crosses have been repeated in sufficient quantity to be fairly certain of the parentages involved. In other cases we are left wondering if *scabrum* x *zeylanicum* or other such hybrid combinations were involved, but the major difficulty is that few of these hybrids bear hybrid names. Practically all have replaced the tropical parents because the latter are not cold hardy.

The first hybrid to be introduced as a species was the *C. fimbriatulum Hort* as the "Milk and Wine Lily" from Nassau in 1887 by P. F. Reasoner of the Royal Palms Nursery. The blossoms are described as three to four inches in diameter, striped white with carmine. It does not appear to be the plant that Henry Nehrling described 25 years later; as Nehrling reports the species is difficult to grow. The fact that it does not give seed suggests a hybrid. However, the plant is significant as it was the original "Milk and Wine Lily."

Reasoner seemingly crossed a number of *Crinum* species as he offered a *C. kirkii* x *bulbispermum album* in 1895 which he reported as similar to *kirkii,* but hardier and of lighter color. The bulbs vigor and greater resistance to frost soon displaced the surface growing, winter tender *C. kirkii.* It is now the sterile *"C. kirkii Hort."* of our gardens. Since the plant was never named we suggest 'P. F. Reasoner' for the clone.

Crinum scabrum crosses very freely with *C. bulbispermum.* The original hybrid is Dean Wm. Herbert's *C.* x *herbertii.* The first commercial clone was introduced by van Tubergen about 1890 and many sibling crosses have appeared since. Even the writer has tried his hand with this one. The form with the prominent red stripe so commonly encountered in the Gulf area has been recommended for the clonal name 'Gulf Pride'.

The cross of *scabrum* or the other *"Milk and Wine"* on *C. bulbispermum roseum* yields solid colored pink to red flowered hybrids in lieu of the red keeled "Milk and Wine." One of the better of these *C.* x *herbertii* crosses is the attractive 'Thaddeus Howard'. It is a robust plant with foliage larger than *C.* 'Cecil Houdyshel' and open, soft red blossoms. Practically all *herbertii* have viable pollen but will only strike on the parental forms or related *scabrum* types such as *C.* 'Cecil Houdyshel', 'George Harwood' or 'Ellen Bosanquet'. Where two red color genes can be brought together as in Mrs. Grace Hinshaw's 'Summer Glow' the solid red trumpet is exceptionally vivid.

Crinum zeylanicum appears to be quite common in Florida and like *scabrum* it is a good breeder. It is often called *C. ornatum* since it is that plant which was featured under the name *ornatum* in the Botanical Magazine at 1171, only to be lumped with *C. zeylanicum* of Burma due to close similarities. In fact if we follow the classification of L. Heritier, *C. zeylanicum* is considered to be a subspecies of *C. latifolium.* With our present day knowledge of plant migration, most of which occurred in past pluvial periods, the probability of a west African species being closely related to a Burmese species appears rather remote. Unfortunately Dr. Carey's critical analysis of *C. latifolium* and *C. zeylanicum* has been completely ignored, otherwise it would be realized that the Asian form of *zeylanicum* and *latifolium* are rather remotely related. His description in "Flora Indica" also brings out the fact that *zeylanicum* in Asia has little in common with the west tropical African *ornatum*. The former has a narrow deeply channeled leaf with entire margins whereas *ornatum* has semi erect slightly glaucous foliage some 2 inches broad with scaberous edges. Both Wyndham Hayward and the writer are in full accord that the west African form is definitely entitled to its original status. This becomes particularly evident when the *ornatum* x *bulbispermum* hybrid is compared to the Asian and African *zeylanicums.* The hybrid is more representative of the Asian form. The blossoms on the hybrid are borne on a 14-inch scape and in lieu of being compact radiate out like spokes on a wheel. They are striped like the typical "Milk and Wine", but are not so conspicuously flared as *kirkii* or *scabrum* crosses. The pollen is quite sterile.

The small hybrid known as *C. sanderianum Hort.*, is also sterile. From its habits and features it could readily be a sibling of Reasoner's "*C. kirkii* hybridum." The only significant differences are in the sizes of the blossoms. The latter is half the size of the "*kirkii* hybrid."

Before closing we should certainly mention something about *C. amabile, C. augustum, C. erubescens* and *C. kunthianum.* All have narrow tepals which are highly colored. On numerous occasions the writer has heard them referred to as "Milk and Wine", but they do not have the trumpet-shaped blossoms of the latter, or the tapering sharply pointed leaves. *C. amabile* belongs to the Stenasters and all the others to platyasters which means the latter have blossoms shaped like *C. americanum,* although they are colored.

Even though these plants and *C. americanum* belong to different subgeneras they will cross with *C. bulbispermum* and *macowanii* as well as with hybrids like *C. 'Cecil Houdyshel'* or *Powelli album* (taking the pollen of the latter only). In a half dozen instances second generation crosses have been obtained. As a consequence there are far more complex hybrids scattered about than is realized and the identity of some can be quite perplexing. However, Stenaster x Coconocrinum have slender, acutely pointed tepals and Playaster x Codonocrinum semi slender bluntly tipped petals. 'Peach Blow' has long been considered a "Milk and Wine" type but its petal shape is definitely Platyaster x Codonocrinum. The bluntly tipped, strap like foliage rules out any parent with acutely tipped slender tapering leaves. From the dilute color only one parent was colored, the other was white. Unquestionably one was hardy, the other semi-tropical. Other parental factors are the spicy fragrance, the type of veining in the leaves and the finely toothed or scaberous leaf margins. Both *scabrum* and *ornatum* are eliminated as probable parents because the pointed foliage would be apparent in the F-1 hybrid. To meet the majority of conditions our most probable selection is *C. yemense* x *augustum,* but we must also consider the true *erubescens* and *kunthianum,* and less likely 'J. C. Harvey' x *americanum.* The fact that 'Peach Blow' has viable pollen and will cross with *bulbispermum* may give a clue concerning the parentage.

One may wonder why the interest in tracing parentages. Thus far the writer has checked out some forty hybrid Crinums and we know the breeding capabilities as well as those combinations which give vigor, good form and color, or resistance to cold or summer heat. Breeding progress is being made because we can avoid many sterile combinations and then eradicate poor siblings if the material is not up to expectations. Thus far the production of second generation material is just beginning but it promises to be interesting.

FREEDOM OF FLOWERING IN NERINE SARNIENSIS

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Although the beautiful *Nerine sarniensis* is native to the Cape Province it is not widely grown here in South Africa. The chief reason for this lack of honour in its own country is that this particular species has gained a not altogether undeserved reputation for being tricky. Often it appears to grow and increase well, but flowering is so erratic and tardy that after a few years many gardeners give it up in disgust and grow the not quite so beautiful but hardier and more free-flowering species such as *Nerines filifolia, humilis* or *bowdenii.* Nevertheless some gardeners regularly produce dazzling displays of these fascinating flowers with apparent ease. Their success may well be due to their thorough understanding of the cultural needs of the plant, but good fortune in obtaining a free-flowering strain of *sarniensis* must also have played a big part in their succes.

Some years ago I was on the look out for a free-flowering strain which would set seed freely. Accordingly I set up a small experiment to test the different available forms of this variable species. I ordered mature flowering-size bulbs from five different commercial sources (Lots A to E) and had three collections made from the wild (Lots F to H). For comparison purposes I used a very free-flowering form of *N. humilis* from Caledon (Lot I) and that well-known, reliable, hybrid nerine "Gaiety" which had been sent to me by Mr. Stanley Smee of Ipswich (Lot J).

Each of the first nine groups (A to I) consisted of 6 bulbs, but only 2 mature bulbs of "Gaiety" were available. I planted these groups in a well-drained, raised bed in the open. The soil was a rich, uniform mixture and I was careful to give all the bulbs similar treatment in the way of water, light, spacing and food. Spacing was four inches apart in rows ten inches apart. For four years I kept careful records of the number of followng stems produced by each group of bulbs. The results of this simple experiment are set out in the Table 1, below.

TABLE 1.

Lot	No. of bulbs.	No. of flowering stems each year.				Totals	REMARKS
		1st	2nd	3rd	4th		
A	6	2	3	4	3	12	Fair. Insect damage 4th year.
B	6	1	3	0	0	4	Very tardy. Prolific offset production.
C	6	5	2	5	2	14	Free-flowering in alternate years only.
D	6	0	0	1	0	1	Healthy but remarkably tardy.
E	6	4	4	5	6	19	Very free, few offsets.
F	6	1	4	5	7	17	Very free. Bulbs not plump on arrival.
G	6	1	3	2	2	8	Tardy, dwarf form. Many offsets.
H	6	2	3	4	5	14	Fair.
I	6	5	5	6	8	24	Very free-flowering. **N. humilis.**
J	3	2	3	3	5	13	Extremely free-flowering. Gaiety.
Totals		23	30	35	38	(126)	

COMMENTS: Different strains of *N. sarniensis* seem to vary enormously in their ability to produce flowering stems even under uniform conditions. Of the first eight groups only E and F were satisfactory while most of the others were mediocre or poor. Lots B and D were exceptionally poor. It would seem worthless for a gardener to persevere with an inherently poor strain. Good soil, ideal conditions and care will not make up for a built-in resistance to flowering.

It is these poor-flowering strains that have given the whole species its undeserved reputation for tardiness, and commercial growers who propagate and distribute inferior forms are doing their customers and the species a real dis-service. The trouble is that the distribution of poor forms is likely to continue or even to increase because two of the three worst flowerers are healthy growers and are most prolific in their offset production; whereas the excellent strain E produced only 3 smallish offsets from 6 mature bulbs in 4 years under good conditions—a hopeless proposition for the commercial grower.

Some strains (Lot C) appear to follow an inherent pattern of flowering every second year. The lean year follows a season of free flower production and prolific seed setting and is used to enable the bulb to build up its reserves for the following season. Presumably Lot C arrived after a year of rest or perhaps the flowers of the previous season had been cut early for marketing before they could set a crop of seed.

The oft-recorded statement that *Nerine sarniensis* resents disturbance and so will not flower the year it is moved does not seem to be generally true. Under the conditions of my experiment it can be seen that if bulbs of a good strain which have reached flowering size are planted in rich soil at the correct time and given proper care a surprising number will flower the first year, as in Lots C and E for example. The surprising lack of first year flowers in the excellent Strain F was caused by the shrivelled condition of the bulbs when received. When bulbs have been well-fed and acclimatised to their flowering site one would expect the numbers of flowers to increase each year. This is what took place, but there was something of a levelling out during the third and fourth years. Some mature bulbs from which flowers were expected broke down to produce offsets instead, and by the fourth year the picture became complicated by the flowering of offsets, as for example in Lots I and J. These remarks refer to *Nerine sarniensis* only, for I have found quite a marked falling-off of flowering in the first year after transfer to fresh ground with such species as *N. bowdenii* and *N. flexuosa.*

One frequently reads that to flower freely nerines must become crowded and tightly root-bound. My experience under South African conditions conflicts with this dictum for I have found that my plants flower more freely in the open ground than they do in pots and they do not seem to resent being spaced 4 to 5 inches apart in rows 10 inches apart. On the contrary, they seem to enjoy it. Yet I must confess that I have lost several valuable pot-grown hybrids through over-potting, especially with small or not very vigorous varieties. Pot plants seem to require a great deal more watering than plants in open beds and this extra water soon turns the soil sour unless roots penetrate the potting-soil rapidly before sourness develops. It is a mistake to overcrowd pots so much that most of the bulbs remain in a half-starved state for years so that they seldom get the chance of forming the six leaves usually needed to ensure a flowering stem the following year. The ideal is to have a few bulbs in a smallish pot containing a fertile, freely-draining compost and to repot before overcrowding causes a falling off of flowers.

The experiment confirmed the free-flowering properties of the Caledon form of *N. humilis* which produced more flowers than the best strains of *sarniensis.* Even more spectacular was the performance of the old hybrid Nerine x "Gaiety" which can always be relied upon to produce masses of flowers year after year. In proportion to the number of its bulbs (3 only) it produced more flowers than any of the other varieties tested. In my experience many hybrid nerines are more free-flowering than their species-parents. Some owe this property to their undoubted hybrid vigour; others owe it to their complete or partial sterility which prevents the exhausting process of seed setting: but there are other seed-setting hybrids which are reliably floriferous, because they are the end-product of years of careful selection by breeders who were aiming to produce a beautiful and a free-flowering hybrid. As the good hybrids which contain this property (many beautiful varieties do not possess it, alas) become more widely distributed, I am sure this exquisite beauty will become increasingly popular in the greenhouses of cold countries and in the open garden in countries with warmer and sunnier climates.

LYCORIS IN LOWER GULF COAST REGION

Claude W. Davis, *Louisiana*

One of the most satisfactory bulbs for late summer flowering in the Lower Gulf Coast is *Lycoris radiata.* These spectacular, orange red flowers seem to bounce out of the bare ground in September after rains in August and early September. Foliage growth follows flowering and remains green during the fall and winter, maturing and dying down in the spring.

Bulb division is rapid and within a brief period large clumps are formed. The plant naturalizes readily and will continue to grow and flower for years in the same bed without separating the clump. As a result they are comparatively inexpensive and are extensively used for yard decoration or as cut flowers. The foliage is not affected by the mild winters which generally prevail in the region, but a few years ago a severe spell of cold weather dropped the thermometer to 10 degrees F., the coldest in fifty years, and the foliage was killed. The bulbs were not hurt, but new growth was checked and the bloom crop was light the following season.

The Florida ''Hurricane Lily'' or *Lycoria aurea,* which is a yellow form, will grow and flower in protected locations, as the south side of a building, as far north as Baton Rouge, La. It is much more tender to cold than is *Lycoria radiata,* but is considered to be more desirable.

Several years ago bulbs labeled *Lycoris radiata alba* were obtained from a grower in Japan. These are not a pure white, but might be described as ivory white. This variety is not quite as hardy as the red form, but the bulbs have survived, increased and flowered for three years. A bed of these makes a very striking appearance, probably due to the great contrast with the more commonly grown red form.

SEED AND PLANT TRADE CATALOGS RECEIVED

APRIL, 1966, OFFERING OF SEEDS, LARGE- AND SMALL & FREE-FLOWERING HYBRID AMARYLLIS. Ludwig & Co., P. O. Box 18, Hillegom, Netherlands.

''LUDWIG AMARYLLIS'' 16th EDITION, [1966-67] CATALOG, Ludwig & Co., P. O. Box 18, Hillegom, Holland. Profusely illustrated in color of named and registered Hybrid Amaryllis clones, *Sprekelia formosissima,* and *Cyrtanthus purpureus.* Thirty-two pages, and cover also in color. August, 1966.

UNIVERSITY HILLS NURSERY CATALOG, 1966-67, Claude W. Davis, Proprietor, 470 Delgado Drive, Baton Rouge, Louisiana, 70808, featuring Hybrid Amaryllis, Amaryllis species, Louisiana Iris and other *Iris; Hemerocallis,* Crinums, *Crinodonna,* Chalice Lilies (*Hymenocallis,* etc.), *Gloriosa,* Zephyrantheae, *Curcuma* and *Kniphofia.* 24 pages.

PRESEASON PRICE LIST, 1966-67. Nov. 1966. 7 pages. Robert D. Goedert, Amaryllis Dealer, Jacksonville, Fla. 32205. Hybrid Amaryllis clones, and seeds; *Amaryllis* species; *Lycoris; Eucharis; Haemanthus; Gloriosa,* and Gingers.

THE 1965-1966 AMARYLLIS SEASON

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This past flowering season was one of the best in several years. Particularly fine reports were received from Texas, Louisiana and other parts of the south. It appears that many beds of amaryllis in the south have recovered from damage received during past severe winters. The past growing season was good here and in Holland and other areas which accounts for many of the fine flowers. The bulbs received from Holland were especially good this past season and almost all flowered exceptionally well. At the present time it appears we will have another fine growing season in 1966 and next spring should be even better than that of this year. This should help to stimulate interest in this fine flower.

I received many fine reports from those who have been growing seedlings both in the border in the southland and in pots in the north. More people should try their hand with seed. It is fascinating and with the availability of good seed one can flower sorts not seen in the named varieties. With some understanding of requirements and a little special attention to details one can be successful in flowering seedlings in three years.

Due to many inquiries as to the care of amaryllis I would like to touch on this subject a little and possibly provide some information from my experience that might help those who have experienced difficulty in growing these fine plants. Possibly I may be of help to a number of fanciers to again stir their interest to new heights and keep them from falling into the pit where most amaryllis fanciers find themselves sometime.

THE AMARYLLIS FANCIER AND HIS DEALER: Often someone sees an amaryllis that has flowered and made an exceptional specimen. He immediately falls in love with the flower. With some difficulty he finds where he can buy Imported Dutch Amaryllis bulbs at a reasonable price. He purchases two or three bulbs, follows directions and has reasonable success flowering them. This may happen for several years and he enjoys the hobby. After this his interest grows and he wants to see more varieties, colors and types. He then purchases quite a few. With these 10 to 20 bulbs he finds there are some complete failures. He then notices that the bulbs he had purchased for several years before are not flowering either; in fact, they are shrinking and some have disappeared. What is happening!! The first thing he thinks of is that his bulb dealer must have sent him old worn out bulbs. So he writes his dealer. The dealer answers him politely but firmly saying he furnishes the best bulbs obtainable and can not be expected to grow them for the customer. The dealer does not take kindly to his demanding replacement of those bulbs that were failures.

Now the new fan has tasted failure and he becomes frantic. He feels the bulb dealer has not acted properly by not replacing the bulbs.

Next season he will find another bulb dealer who is more "reliable" even if he has to pay more for his bulbs. He orders some from the new dealer. He may have success the first year but eventually the same cycle happens again and he finds himself writing the new dealer. The new dealer tells him the same thing but usually a little more bluntly. At this point he gives up completely and may forget amaryllis for other flowers or other hobby. He may not completely give up. He may only lose interest for a season or so but his experience has mellowed him. He finds himself writing the original amaryllis bulb dealer. He is asking for advice and the venom is gone. The amaryllis dealer will try to advise him as to where he made mistakes and also that everyone has failures. Once he understands that others are experiencing or have experienced failures he has more faith in himself and growing amaryllis becomes a challenge to him.

The belief that amaryllis are easy to grow is wrong. Most dealers try to send out the best bulbs obtainable. The point I would like to make is that most amaryllis imported from Holland, except for a few like 'Apple Blossom,' 'White Giant' and 'Ludwig's Dazzler,' come from the same sources, unless you happen to trade with some unscrupulous firm of which there are few, if any, as there is little money in this industry and that does not appeal to those looking for a quick and easy profit.

The varieties not raised by the originator, such as 'Apple Blossom,' are generally grown by a grower who is equally as good. The bulbs you buy usually come from the same source regardless of the dealer you trade with. The bulbs should respond as well from one dealer as another. The only difference is in the handling of the bulbs after they are shipped from the grower and the service you get. The bulbs can get over heated or be subjected to extreme cold in transit. This will have some bearing on the results and this is usually unknown to the dealer. He has little control over this except seeing that the shipment is not delayed in transit.

The bulbs often have sweated in shipment and once received the dealer must dry them off quickly so as to prevent rot developing and keep the bulbs dry in storage. He should keep them dry until packed and they should be properly packed to keep them from being damaged by cold in transit to the customer. One of the best assurances that the bulbs do not get damaged by cold in transit is that they be throughly cured before they are shipped and are dry when packed. Other than assuring proper handling the dealer can do little to insure you good results. The growing season has a great deal to do with how your amaryllis will respond. The Dutch know their business; however, even with their know-how every amaryllis bulb they produce does not always give satisfactory results.

The Dutch growers grow amaryllis especially for potting and they select seedlings for propagating that will produce a nice looking bulb in a short time and flower well when forced. This is their criterion and one must realize this means they are interested in giving you a bulb that flowers well the first season. They do not breed for a continuing flowering habit; however they have to pick vigorous clones and many can be maintained in flowering condition year after year. But some just do not respond well after the first flowering season after they are purchased.

I think if you would ask most dealers, and possibly the Dutch growers, they would prefer the customers who buy a few bulbs each year to flower for their own enjoyment and when the flowers are gone they throw the bulbs over the back fence or give them to a neighbor to try to nurse them along. Next season they purchase new bulbs. This type customer figures when the bulb flowers they got their $3.00 to $4.00 worth and they are satisfied. These customers often have the dealer pick out clones that are easy to flower and due to this fact and the fact that they are satisfied to receive the same clones each year they are more successful than the person who makes a hobby of nursing bulbs along from one season to the next.

Do not feel that I am against the hobbyist for I am one myself. But the hobbyist must get enjoyment from the challenge and the growing and accept the failures. If only the flowers fascinate you, stick with a few new worthwhile clones each year and when you get through with them give them to a neighbor who wants to experiment with the bulbs.

HINTS ON CULTURE: To get back to the fan who has begun experiencing failure. His bulbs seem to shrink each year. Whether they are planted in a bed or in a pot makes little difference. From where I sit, if you want to take the trouble to bring them back, here are a few points that might help.

The main reason amaryllis fail is that they lose their roots or just fail to grow them. The Dutch growers when talking of failure say their amaryllis lost their roots. If your amaryllis are doing poorly you will generally find they have few roots during the growing season. What should you do?

First, most root failure is caused by one of the following, in the order I consider most prevalent: 1. Insects and soil borne fungus; 2. A soggy soil, poor drainage; 3. An acid soil; 4. A poor supply of fertilizer.

If you have amaryllis that are doing poorly I would first suggest you dig them and spread them out on a concrete area or other paved surface that is drained. Let them stay in the weather 6 to 8 weeks. The rain and sun will do wonders to clean the bulbs of insects and fungus. After this find a new area for the bed or new potting soil. The soil must be open textured and well drained. If the soil is acid add some lime. I prefer oyster shell as it tends to keep the soil from becoming too heavy. Make the soil rich in organic fertilizer or start a program of providing liquid fertilizer each 10 days to two weeks. You will find when replanted the bulbs will acquire new life.

Now if you do not have the time to repot the bulbs or make a new bed and the soil is suitable, I suggest you get a good mitecide such as

Cygon and drench the pot or the bed with a solution in water. After the insecticide has been in the soil several weeks obtain a good fertilizer and make a weak solution and water with it for several weeks but let the bed or pot dry some between each application. This will often start growth.

I suggest you drench your potted amaryllis or beds of amaryllis at least twice a year with a good insecticide. I use Cygon with some success. There might be others that are better. One application in the spring, one in mid-summer and spray the foliage each six weeks between. The insects that hurt are the ones you can not see.

WHERE TO GROW YOUR AMARYLLIS: If you have your amaryllis in a bed, pick a place in the open with tall trees to the west. I feel this is best as this gives them sun in the morning and a little shade to rest afternoon; also the sun will peek through under the trees in the afternoon. They need plenty of sun. You will find the white ones will do poorly unless they get lots of sun and they also appear to like a little more lime.

Often I am asked what size pot to use. This depends somewhat on the nature of the particular clone but will range from 5″ to 10″ according to the care you will take of it. Generally if they are to be set out in the open where watering is not controlled, choose the smaller sizes and you will get best results. I generally use a 5″ to 7″ pot.

Where should you place the pot during the growing season? If you are having luck, keep them where they are. If you have one or two pots you might place them in one of the following spots: (1) on the edge of the border up against other low plants that will shade the pot but allow sun on the foliage, or (2) on a box slightly on the edge of a hedge where humidity will be fairly high, yet ventilation is good. One of the best bulbs I ever had was from a pot set slightly under the edge of border grass. Another pot I had great success with was set on a table where azaleas overhung the pot slightly. They do not like wet feet, but a day or two of rain will often clean insects from the roots, and result in new vigor.

A TABLE FOR YOUR POTTED AMARYLLIS: If you have a lot of pots I would suggest you build a table to set them on. For the top use 1 x 4″ with an air space of about ¾ inch between each board. This will allow air flow through the plants and help keep the roots cool, prevent the pot from becoming too wet, and allow evaporation from below to keep the humidity up. You will find such a table will lead to success. It keeps weeds from growing over into the pots, and helps make caring for them much easier from the back. Use treated lumber so termites do not destroy it. Also nail a sleeper to the legs so it does not mire up in the ground. Set it at the outside edge of the foliage of a tree.

Well, enough advice on growing amaryllis. I do hope you will find some of the comments helpful.

THE 1966 FLOWERING SEASON—GROWING SEEDLINGS: Again getting back to the past flowering season I would first like to comment on the reports of extra fine blooms from seedlings. Many reported super flowers which they said made some named clones look sick. Now, don't low-rate the named clones. Often the first flower from the seedling is its best and never again will it be the same unless great care is taken in culture. Like other hybrid seedlings the maintenance of color and size requires the best of culture. However you will find some that will improve in future years with ordinary culture. You must remember that the Dutch develop many seedlings of similar color in order to introduce a clone and often it is superceded in 5 to 6 years after introduction. Do not get your hopes too high with your seedlings but if you plant good seed you should get many worthwhile seedlings and most will be worthy and have nice clear colors.

NAMED CLONES: Picotee types in the named Dutch varieties remain very popular followed by the pinks and pink-and-whites. The solid colored clones remain popular but bitones, blends and novelty types gain favor.

White clones: The whites have always been popular particularly with the beginner. And like the Japanese, white flowers have always been a favorite with me. The whites are some of the easiest to force, and they make good clones for the beginner. There are many fine free flowering whites. 'White Christmas' is possibly the most popular. It holds roots well in storage and always gives a good account of itself especially as a pot plant. 'White Giant' is a fine large white that is easy to flower. 'Early White' is a new one that gives great promise. It makes fine large flowers. 'Ludwig's Dazzler,' 'Marie Goretti' and 'Winter Carnival' all perform well. In the exhibition class manv say 'Oasis' is tops. Van Meeuwen's 'Mt. Blanc' is also a fine exhibition type. Many of the whites are much alike. The C. Warmenhoven whites, none named, caused many fine comments this past season. They are free flowering and have a beautiful ivory cream color when first open. They are large and handsome and to the breeder for yellow they might prove to be a good seed or pollen parent.

Near White Varieties: The near whites gain popularity. 'Picotee' is most popular. 'Peppermint', 'Marion' and 'Siren of Paradise' in white with a fleck of red are popular. 'Peppermint' has more red, 'Marion' is huge and 'Siren of Paradise' is extra tall and large; fragrant and a wonderful exhibition clone.

Bi-tones And Striped clones: I would like to take up the red and white bitones and stripes at this point. This group has always been weak. Ludwig's 'United Nations' and 'Carausel' are notable. Van Meeuwen's 'Orion' is a vigorous growing large flowering clone. If the color was brighter it would be most outstanding, but it is still worthwhile especially in hybridizing. Warmenhoven's 'King of Stripes' is a fine round flat form, however smaller than most clones.

Pink and White: Pink and white is a good color combination especially for the ladies. 'Apple Blossom' still remains popular; however 'Rose Marie,' 'Pygmalion', 'Rosy Dawn' and 'Love's Desire' (with a little more color) gain in popularity. All four are fine clones. 'Pygmalion' is earliest and is possibly the most free flowering. 'Artemis' is a new exhibition type that grows tall and large. It should make a name for itself on the show table.

Blended Color Varieties: The blends are popular and many new and worth while clones have been added to this list in the past several years. In shrimp pink and white 'Margaret Rose', 'Sweet Seventeen' and 'Day Dream' are very similar and all are fine. 'Day Dream' is somewhat the largest. Ludwig's 'Gypsy Girl' caused quite a lot of excitement last season. It is large and beautiful.

In orange and white blend 'Golden Triumphator' grows large and is vigorous. 'Cupido' and 'Pinksterflower' are fine but similar. Warmenhoven's 'Catherine Valenti' is exceptionally fine in rose and white with extra large heavy textured flowers. His other clones, 'Television', and 'Mount Everest', although less spectacular, have merit for they lend different color combinations to any collection of blends. 'Floriade,' white and pink, demands top billing and many fine reports are received on it each year. It is fine. 'My Fair Lady' in red and white blend is different, an exciting new color combination.

Beacon is still in a color class of its own being salmon pink and white. It grows large easily. Pink Beauty, a similar variety, in salmon, red and white has fine form. It has more white in it than Beacon.

Pink clones: Ludwig's clones lead the pinks and are about all that are available. 'Heaven Sent' appears to be the favorite. It is a beautiful soft rose pink. 'Dutch Belle', a light rose pink, is second in favor followed by 'Flora Queen' in lavender pink. Clone 101 and 'Sight Show' remain popular. Warmenhoven's 'Little Diamond' is considered by many to be tops in pink; however, it is expensive and not reliable as a substitute for 'Pink Beauty'.

Rose clones: In the rose shades Ludwig's 'La Forest Morton' is a fine light rose and stands out by itself. 'Trixie' is an exceptionally fine formed medium rose red that should be in all collections. 'Violetta', a fine round flat formed violet rose is outstanding and of a color all its own. 'Elvira Armayo', a medium rose lavender, is very large and liked by many. 'Moreno' and 'Bordeaux' still remains the only dark rose reds available.

Reds: Good bold reds are always popular but I find them less dependable than other sorts generally. 'Barbarosa' is a nice bright red. 'Scarlet Leader' holds its roots exceptionally well in storage and is an outstanding free flowering forcing clone. 'Ludwig's Goliath' makes huge flowers and flowers easily. 'Scarlet Triumph' is fine. 'Red Champion' is a popular larger exhibition type. 'Flamboyant' still is sought after. It has exceptionally fine form. 'Mars' and 'Rembrandt' are still favorites in the standard dark reds. Van Meeuwen's new clones, 'Bernice' and 'Queen of the Night', were well received last season. C. Warmenhoven's new dark red, 'President Kennedy', is a fine flower. 'Purple Queen' still remains popular. Ludwig's 'It' is about the darkest red available and a mighty fine new one. 'Mohawk' is the finest wine red, much like 'Red Master', but with four flowers per scape. Propagation problems keep it off the market so one may have to string along with 'Red Master' although it only makes two flowers per scape.

Salmon clones: There are a number of fine salmons available. 'Rilona' is a soft buff salmon. 'Bouquet' is still one of the finest available. Ludwig's new 'Beautiful Lady', a golden salmon, is exceptionally beautiful and a wonderful color. In still a deeper tone the new 'Hecuba' found favor with many. 'Delilah' is still a fine tangerine colored clone in a class by itself.

Orange clones: Good oranges are still much in demand and there are several that you will find exceptional. 'Orange Orchid' causes the most comment. It is a fine color and appears double. 'Orange Wonder' is still very popular and in demand. Ludwig's 'Home Decorator' is liked by many. 'Mrs. Warmenhoven' is a beautiful new one. 'Cavalier' is possibly the largest in this color.

African Amaryllis: Of the African Amaryllis ''Clone 65,'' a fine scarlet, is possibly the most free flowering. The bulbs shrink a great deal in storage, however this does not appear to affect its free flowering 'habit. The new 'El Toro' is an exceptionally fine orange. It is a sensational bronze orange that is one of the finest oranges ever introduced. 'Rosedale' in rose still flowers well. 'Rosaline,' a brick rose and white, still flowers easily. ''Clone 242'' is a fine striped clone that most people like. The African amaryllis are popular and each year they give a better account of themselves.

In commenting on clones one can never cover all the fine ones that are available. Each year when I re-read this article in the Year Book I think of clones I should have mentioned. So if I did not mention the ones you hold in high esteem do not feel that it is inferior. I try only to comment on those that impressed me in the previous season and often it may be that a certain clone bloomed when I was too busy to give it special attention (this often happens). Generally I feel that those I comment on have considerable merit.

SPECIES: Last season I did not collect many new species and like most of us who are interested in species, my interest comes and goes as the temperamental ones fail to respond. Generally I find I neglect the species due to lack of time. I lost many species bulbs due to lack of care during this past winter. You do have to give species special treatment.

When you neglect the species there are some rewards and this is to find the ones that are most adaptable for his particular area. In this regard I would like to comment on those species that do best in North Florida.

Amaryllis aulica var. *stenopetala* will naturalize in the North Florida area. It grows well in the Jacksonville area but needs some winter protection if temperatures drop below 25° F. for any length of time. It grows well. However being summer dormant, our rainfall during this period breaks its dormant period so it seldom flowers. It is a tough large flowering vigorous species and should receive the interest of the breeder.

A. belladonna naturalizes here and other areas in Florida. The past cold winters have not been kind to it. It does best here in well drained sandy areas. An abundance of rain in summer gives it enough moisture to grow. *A. belladonna* grows in low ground along the Amazon River where the average temperatures are in the 70° F. range. In areas where winter temperatures are lower it has to have a well drained location so it does not succumb to the cold wet condition. I have found *A. belladonna* is more adaptable to acid soil than other species. I have had luck in growing it in boxes of peat. It takes large quantities of water in summer where temperatures are above 70° F. at night. If night temperatures are lower it must be kept drier to prevent cold damage. I feel *A. belladonna* can be grown successfully in pots if you can keep it well watered and above 70° F. at all times. If you do let it go dormant let it be dry and never below 50° F.

A. striata will naturalize in lower Florida, however it rots easily if given a cool wet condition. It should be kept in an evergreen condition for best results. If you wish to let it go dormant dig it in a green condition, clean the bulbs and keep in a dry state above 60° F. It is a very successful pot plant and will thrive in a large pot. One should give the pot an insecticide drench especially in the south to eliminate mites and other root attacking insects. If the leaves of your plant show modling it more than likely indicates insect trouble on the roots. *A. striata* is very susceptible to insect damage but it is a wonderful plant that makes off sets at a rapid rate and with one bulb you can have several hundred in a few years if properly taken care of. The species SA 62-22 collected from Armacao near Itajai, Santa Catarina at sea level is the most robust of the forms of *striata* I have found. The flowers are medium size 3 to 4″, very vigorous and appear to stand more extremes in temperature and other conditions than other forms of *striata* which I have. I have made several crosses using this form and Dutch strain amaryllis. I believe it is *A. striata* var. *striata.* I have another large flowering form of *striata* from the Island of Santa Catarina which is not hard to grow. Hybrid form SA 63-22 should prove interesting to the hybridizer as it is more insect resistant than other forms of *striata.*

Another species that has done well in the Jacksonville area is SA 63-16 from Teofilo Otoni, Minas Gerais. It grows in full sun on rocks in the wilds. I have it planted in sandy soil. It grows rather vigorously. The few flowers I have had have been of a rather muddy peach color but very large and airy. The flowers were up to 7″, tepalsegs fairly narrow but fairly uniform in width. It has a small stem, about 3/8″; however the bulbs have gained considerably in size during this past season and I expect larger flowers next season. It should make a good hybridizing subject for developing amaryllis hybrids for the Florida area.

Before I close there is one lot of species bulbs I collected last season I would like to comment on. This is Lot SA 65-23. These were collected at Figueira, near Pedreira, Santa Catarina and are called Acucena gigante. It flowers in the wilds in October/November. Where it grows it has a temperature range of 5 to 32° C. It grows on rocks under trees. This lot of bulbs contained three different species. One appears to be a type of *A. aulica.* Only a few of these were in the lot. The others appear to be *A. reticulata striatafolia* and *A. reticulata.* The *reticulata* has a fine white stripe down the center of the leaf which is leathery dark green. The flower was white and purplish, red striped. I have been told by people who have traveled in South America that they have seen this species growing in the mountains, and that it makes large plants with wide leaves 3 feet or more tall. Possibly this is where it gets the name ''Acucina gigante''. It appears to grow best during cool weather. Those traveling reported that they saw it in the mountains when the weather was chilly. I tried to make mine go dormant last fall and lost most of them. The ones that did not die did not start growth again until September. I plan to keep them evergreen this winter. I assume they will be much like 'Mrs. Garfield' and prefer a fall growing period with a mid-summer or early fall-flowering period. This should prove to be an interesting species but I feel it should be grown as an evergreen or winter growing sort.

I expect to get several new lots of species from new areas of Brazil this winter. Like most fans the species fascinate me but as a commercial adventure they are a failure. Possibly when I retire in several years I will have additional time to care for them and can put them to good use in developing new hybrids which has always been my hope.

ASEXUAL PROPAGATION OF **LYCORIS**

E. G. Corbett,

Crops Research Division, Agricultural Research Service, U. S. Department of Agriculture, Glenn Dale, Maryland.

Although a great deal has been written about propagation of various members of the Amaryllidaceae there is very little in the literature on techniques of propagating *Lycoris.* The usual procedure apparently has been to depend on natural increase of the bulbs or the production of offsets. Recently, the supply of bulbs has largely depended upon imports of bulbs collected from the wild in Japan. Natural vegetative reproduction has been completely unsatisfactory with some species, notably *L. chinensis,* P. I. 162443. Twenty-five bulbs of this plant were introduced by the USDA in 1948 and sent to the U. S. Plant Introduction Station, Glenn Dale, Maryland. The bulbs have produced no daughter bulbs during 17 years at Glenn Dale. This condition, and the fact that most dealers list only 1 or 2 of 17 known species (5), suggested the need to determine some means of propagating *Lycoris* more rapidly.

The standard methods of propagating other members of the Amaryllidaceae have been thoroughly covered in numerous publications such as Plant Life (2), and it would be of no value to recount them here. Taxonomic and popular articles have frequently referred to the close affinities between *Lycoris* and *Amaryllis* (1, 4). Morphologically the bulbs of *Lycoris* are quite similar to bulbs of *Narcissus* and *Amaryllis,* so similar that they may be easily confused. Therefore it was believed that the methods of propagation used with the two latter genera might be applicable to *Lycoris.* This belief was strengthened by the comments of Caldwell (3) regarding asexual propagation of *Lycoris.* The genus *Lycoris* may be separated quite readily, however artificially, into two groups: those species producing leaves during fall and winter, and those producing leaves in spring. The species all flower during mid to late summer and early fall.

MATERIALS AND METHODS

Bulbs of *L. radiata* P. I. 227995 (leaves produced in fall) and *L. incarnata* P. I. 130621 (leaves produced in spring) were dug on July 20, 1964. These species were selected to represent the two categories based on the time of appearance of the leaves. The bulbs were dried and held until November 7, 1964, at which time they were used in propagation experiment. The treatments were: (1) scooping of the basal plate to approximately two-thirds of the depth of the plate, (2) cross cutting the basal plate into 4 equal segments, (3) sectioning of the bulbs into halves and quarters, and (4) no treatment. The propagules were dusted with a 2:1 mixture of Hormodin #1 and Fermate and allowed to dry for 2 days to promote suberization of the wounded surfaces. The propagules were planted in sand in a greenhouse bench and watered as needed throughout the experiment. The plants were removed from the bench on June 14, 1965 and the results tabulated. The bulbs resulting from the test were planted in a cold frame outdoors to determine the length of time required to develop to flowering size.

RESULTS

The results of the various treatments with both species tested are shown in Table 1. There was a marked increase in the number of bulbs with all treatments involving division of the bulb. Scooping of the basal plate resulted in a slight increase in bulbs, with *L. incarnata* showing the greater response to this treatment. The additional bulbs were the result of splitting of the treated bulbs rather than the production of

Table 1. Results obtained from propagation treatments with 2 **Lycoris** species.

Treatment	**No. of Bulbs**	**Propagules**	**No. Rotted**	**Propagations**	**Percent increase of bulbs**
L. radiata 227995					
No treatment	85	85	0	89	4.7
Scooped	85	85	9	88	3.5
Cut	84	84	8	156	85.7
Sectioned ½	39	78	20	63	61.5
Sectioned ¼	37	148	78	79	113.5
L. incarnata 130621					
No treatment	41	41	0	41	0
Scooped	45	45	0	61	33.3
Cut	45	45	0	114	153.3
Sectioned ½	15	30	1	34	126.6
Sectioned ¼	28	112	25	93	232.1

small bulblets as is usually the case with scooping. Table I also shows that the rotting of the propagules was in direct relation to the degree of injury. The loss of propagules through rotting was most severe when the bulbs were sectioned into quarters. These results indicate that division of the basal plate or sectioning of the bulb will promote the production of new bulbs.

DISCUSSION

The results give the impression that, under the conditions of this experiment, methods involving severe wounding, such as cutting the basal plate or sectioning the bulb, are useful in providing a rapid increase in bulbs of the species tested. Although the number of propagules which rotted was much greater when the bulbs were quartered, the net result was still a greater increase in bulbs than by any other method. It is possible that improved techniques during suberization could reduce or eliminate the rotting of the propagules.

Comparison of the sizes of the bulbs as depicted in Figure 48 clearly shows that the smallest bulbs resulted from sectioning. It still must be determined whether these small bulbs can be grown to flowering size within a reasonable period. Another factor that must be considered is field survival of these smaller bulbs. The bulbs have been set in a cold frame and an evaluation of these considerations should be forthcoming.

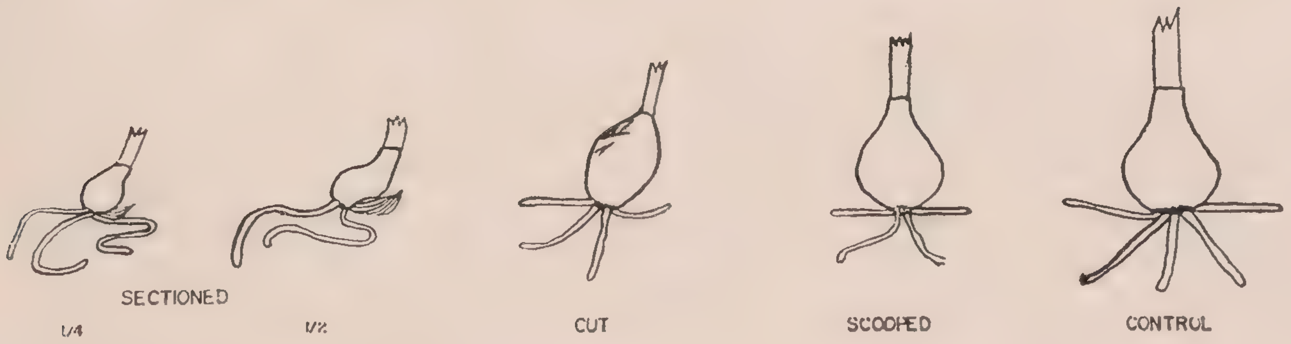

Fig. 48. Comparative sizes of bulbs of **Lycoris incarnata** resulting from the several propagations: sectioned, ¼ and ½; cut; scooped and control. See text and Table 1.

Additional tests with other species must also be undertaken to ascertain whether the techniques are applicable throughout the genus. The timing of the treatments should also be investigated as there is no information on this vital subject. This can be especially important with a plant like *Lycoris* which produces leaves at one season and flowers at another. The cultural requirements of the propagations should also be determined. Again there seems to be no information on this subject, yet herein may lie the answer to the erotic performance of several species as frequently reported (3, 4).

The present results, however, provide evidence that cutting the basal plate or sectioning the bulb will result in a substantial increase in the number of bulbs of *L. radiata* or *L. incarnata.* The untreated bulbs produced almost no new bulbs; the technique of scooping was not much more productive. It should be possible to adapt these methods to field production thus increasing the availability of bulbs of the several species. This greater availability might help to popularize an ornamental genus which appears to be more widely adapted than has generally been recognized.

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A PRIMITIVE AMARYLLID—HANNONIA HESPERIDIUM

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Fair Oaks, California 95628

Attempts to key out *Hannonia hesperidium* fail due to its being one of the most primitive Amaryllids in existence. In plant identification we generally overlook the past ecological histories of an area, but past Arctic

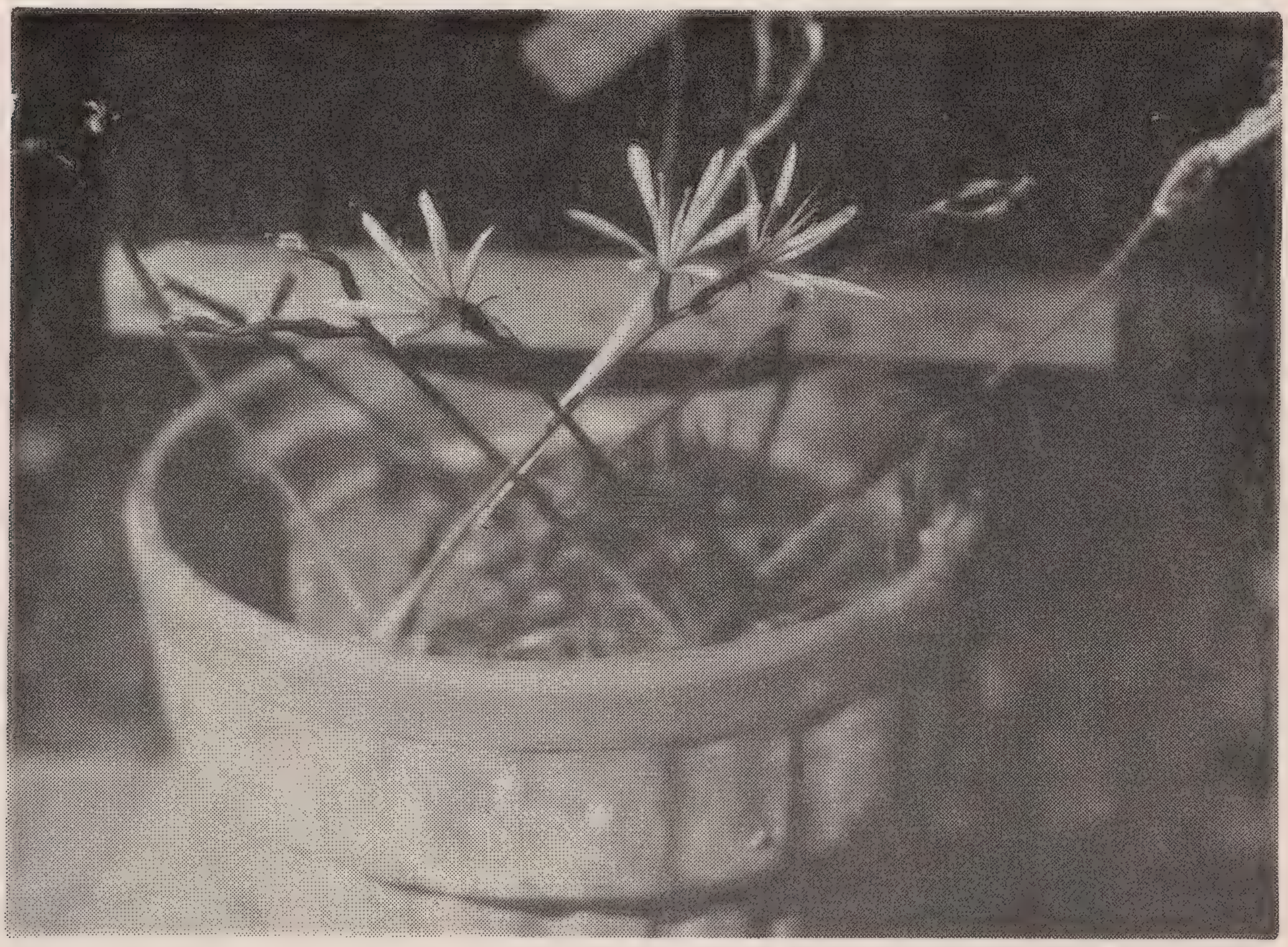

Fig. 49. **Hannonia hesperidium** Braun.-Blanq. & Marie, the amaryllid from Morocco, as grown by L. S. Hannibal, Fair Oaks, Calif. The rule in background is 6 inches long.

and Antarctic ice ages are powerful factors in effecting some change in the climate—all of which causes plants to migrate or to progressively adapt to slowly changing conditions. As a consequence there are few places where plants can survive for several million years without major change but the west coast of Morocco and Spanish West Africa can be so rated, and this is particularly true of the Hercules Peninsula where *H. hesperidum* is localized.

In general morphology *Hannonia* resembles *Sternbergia,* but with petals and other essential parts reduced by desert conditions to a mere vestige of the *Sternbergia* we know. True the plant could be a primitive *Pancratium* or *Narcissus* but there is no evidence of a membrane or cup, and the hard gritty black seed rules out the suggestion of several genera like *Zephyranthes.*

In growth habit the plant resembles a small *Sternbergia lutea.* The first watering in September brings the plant into instant flower and the foliage soon follows. The plant is adaptable to the coast of California but the white flowers are so completely insignificant and short lived that it would never have garden interest.

ADDENDA

The writer notes several articles including that of Dr. Fernandes which relates *Hannonia* to *Leucojum.* Unfortunately there are several distinct morphological features which appear in decided conflict and unless different plants are involved there is good reason for the writer to consider his material, which was received from Gattefosse of Cassa Blanca, to be related to an early form of *Sternbergia,* wherein *Hannonia* is reduced to the bare essentials of *Sternbergia* due to the arid habitat.

First the blossoms of *Hannonia* have a very distinct linear tepaltube some 10 mm. in length by 3 mm. diameter. Secondly the tepals are all equal and linear, being some 14 mm. long x 2 mm. wide. They are keeled on the exterior by a very slender pale green midrib. The filaments are white, spreading uniformly like a *Sternbergia,* are about 10 mm. long and are of the same length as the style. The scape is solid, two edged, and the seeds are a shiny black, elliptical in shape and about 2½ mm. in length when fresh but rapidly dry down to a shriveled pellet.

In *Leucojum* there is a bare suggestion of a flared tepal tube in Subgenus *Acis.* Tubes are lacking in the others and allied genera. No *Leucojum* has linear perianth segments and F. C. Stearn identifies the segments as being distinct from one another.

[EDITORIAL NOTE.—Mr. Hannibal uses only data from gross morphology in determining relationship but data from as many disciplines as possible, chromosomes, embryology, chemistry, etc., in addition to gross morphology are required in reaching a scientific conclusion.]

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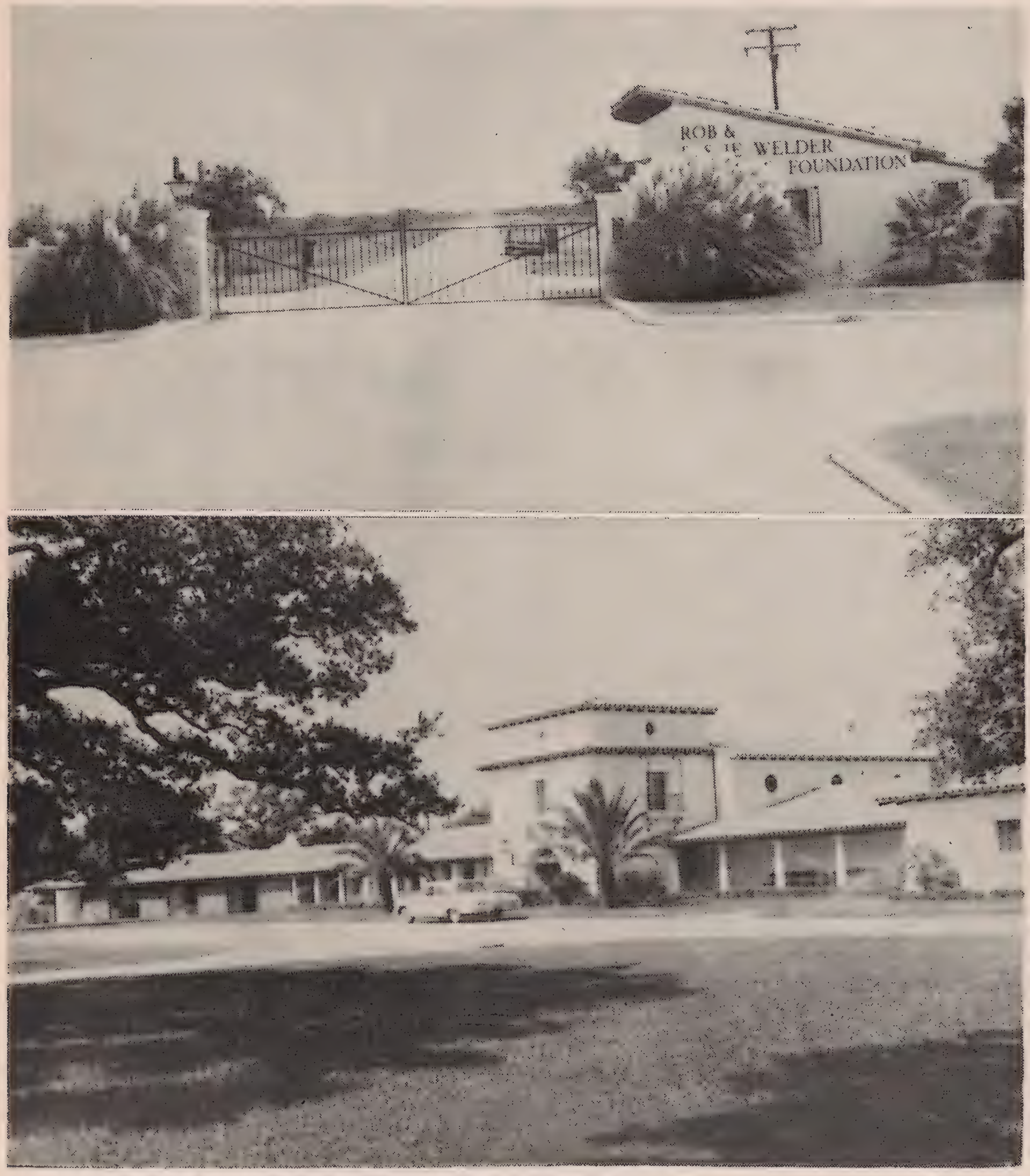

Fig. 50. Welder Wild Life Refuge: **upper:** entrance; **lower:** Main building. Photos by F. B. Jones.

THE WELDER WILDLIFE REFUGE AND ITS AMARYLLIDS

FRED B. JONES, *Research Associate,*
Welder Wildlife Foundation, Sinton, Texas

Only a few associates of R. H. Welder, owner of one of the largest cattle ranches in South Texas, knew that at his death the choicest natural area of his ranch would be retained as a place for the study of wildlife.

Mr. Welder died in 1953. It was his desire and purpose, as stated in his will, "to further the education of the people of Texas and elsewhere in wildlife conservation" and to provide a place where wildlife research could be carried on. By a devise of his will, the Rob and Bessie Welder Wildlife Foundation came into being and a 7800-acre tract of nearly virgin land lying along the Aransas River northeast of Sinton was set aside for its use. This acreage was to be a wildlife refuge, but not strictly a wildlife sanctuary.

In 1955, Dr. Clarence Cottam, formerly Asst. Director of the U. S. Fish and Wildlife Service, became the first director of the Foundation and Mr. Caleb Glazener, previously head of research for the Texas Game and Fish Commission, his assistant. During the first few years, much attention had to be given to the providing of adequate facilities for the students and others who would be coming to the Refuge to work and study. Surveys had to be made, roads making all parts of the area accessible built and artificial lakes dug to insure that the wildlife would not suffer in times of drought. For the headquarters, an open area surrounded by mottes of Live-Oak was selected and a fine building in Spanish colonial architecture erected. In it were well-equipped biological laboratories, a specimen room for scientific collections, a library, a museum for the display of native wildlife, a lecture hall and offices for personnel. Nearby were built a splendid dormitory for the use of resident students and visitors, a screened rotunda for group activities and beautiful homes for the director and assistant director.

By the beginning of 1961, the physical improvements, except the paving of roads, were near completion and in April, a formal dedication was held. It was a gala event with hundreds of invited guests from Texas and beyond in attendance. Many persons well known in nature, wildlife and conservation fields were there.

Long before the dedication, however, the Foundation had begun a program of research and education. From far and near came qualified graduate students holding Welder Foundation fellowships or grants-in-aid to carry on research for their dissertations. By 1966, scores of students had worked extensively on the Refuge and of course other researchers had been there too. The investigations dealt primarily with wildlife and its environment and ranged from studies of fish, snakes, gophers and ground squirrels to soil types, range grasses, predator-

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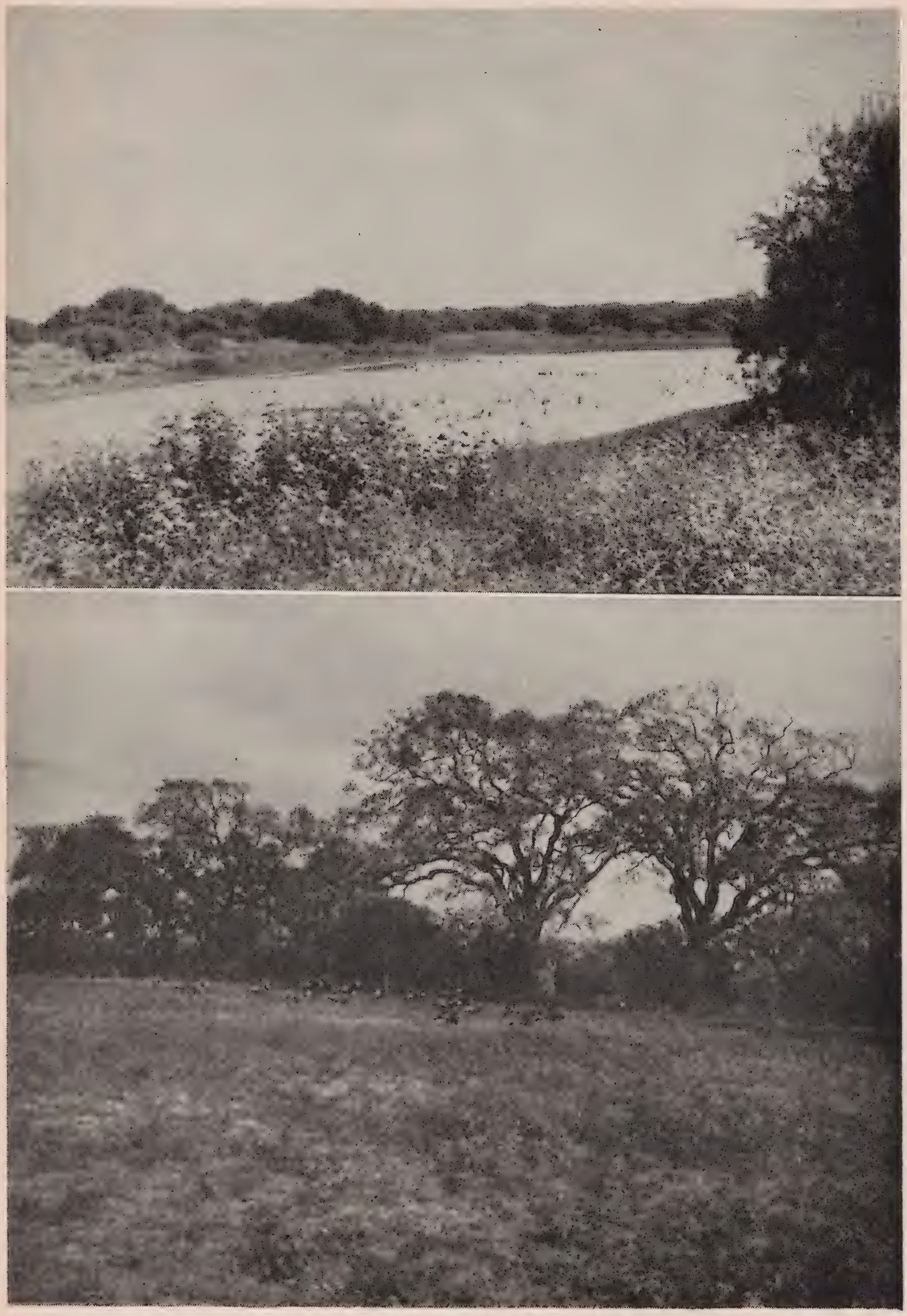

Fig. 51. Welder Wild Life Refuge: **upper:** Encino Lake, photo by F. B. Jones; **lower:** wild turkey, photo by W. C. Glazener.

prey relationships, feeding habits of deer, turkey and javelina and the nesting habits of waterfowl.

The program of educating the people of Texas and elsewhere took many forms—presentations before clubs, releases to newspapers, articles in periodicals, pamphlets and even book-size publications. Youth groups came to spend a day or night on the grounds while high school and college biology classes made field trips to the area. Every Thursday afternoon there was a conducted tour of the Refuge for the general public.

My first visit to the Refuge was in the spring of 1958 when a club I belonged to was shown over the area by Dr. Cottam. Black brush *(Acacia rigidula)* was blooming, its spiny branches crowded with white or cream-colored spikes. Mesquite was putting out its feathery leaves. Here and there in open areas were patches of wildflowers just coming into bloom—Indian Paintbrush *(Castilleja indivisa)*, Bluebonnet *(Lupinus subcarnosus* and *L. texensis)*, *Phlox* and *Coreopsis*, to mention a few. The road led down to the river where there were tall Cedar Elm, Hackberry, Anacua *(Ehretia anacua)* and other trees, some of them draped in Spanish Moss *(Tillandsia usneoides)* or supporting giant Mustang Grape. From there we drove perhaps 5 miles over winding roads between mottes of Live-Oak and across a grassy prairie, finally arriving at an area of natural lakes. Circling in the sky was a bird of prey and Dr. Cottam, always on the ready for accurate identification, pronounced it Sennet's White-Tailed Hawk, mentioning that at one time it was common in South Texas but was now becoming scarce and that he knew of a nest on the Refuge. Driving back to the gate in late afternoon, we passed scores of grazing deer and occasional flocks of wild turkey. A lone coyote crossed the road ahead of us.

Since that first visit, I have been on the Refuge many times and have become fairly well acquainted with its vegetation. Over 700 species of flowering plants and ferns representing more than 90 families have been found to date. Around 5000 species are known from the entire state of Texas, so considering that the Refuge is only 7 miles long and averages less than 2 miles in width, it obviously is rich in species. The explanation is the great diversity of habitats. In the river, lakes and ponds and along their edges are aquatic and other moisture- loving plants. Near the river are shady woods harboring species not found elsewhere. Beyond the woods are areas of sandy and loamy soils, some of them loose and deep and covered with grasses and wildflowers, others heavier and supporting Live-Oak, Mesquite and brushy vegetation. A considerable part of the Refuge is a clay prairie with scattered clumps of brush and a profusion of grasses. There are also swales where water stands for days after a rain, and sloping grounds, bluffs and ravines.

The Amaryllis Family is well represented but the populations often go unnoticed because usually, they are mixed with many other plants that tend to obscure them. Twelve species or varieties have been recorded and it is unlikely that more than one of the remaining six species known from this part of Texas will be found here. Generally, the

Amaryllids may be recognized by their linear leaves, leafless stems (scapes) and flowers having 6 tepalsegs and 6 stamens.

KEY TO GENERA

- 1a. Umbel 1-flowered, by reduction:
  - 2a. Perigone declined; stamens and style fasciculate, declinate-ascending .... HABRANTHUS
  - 2b. Perigone erect; stamens and style erect or ascending ... ZEPHYRANTHES
- 1b. Umbels few- to many-flowered:
  - 3a. Tepalsegs 80-110 mm. long, linear .... HYMENOCALLIS
  - 3b. Tepalsegs less than 12 mm. long, lanceolate, ovate or elliptic
    - 4a. Leaves onion-flavored .... ALLIUM
    - 4b. Leaves bitterish, not onion-flavored .... NOTHOSCORDUM

HABRANTHUS. RAIN LILY. COPPER LILY.

H. texanus (Herb.) Steud. *(Zephyranthes texana* Hook.)

Opening in the morning, scentless; perigone usually 2.5-3 cm. long, funnelform, reddish orange outside, orange-yellow within. Frequent on sandy or clayey loams. June-November. Widespread in Texas.

ZEPHYRANTHES. RAIN LILY.

- 1a. Flower sessile or rarely with a minute pedicel
  - 2a. Perigone white .... **Z. herbertiana**
  - 2b. Perigone yellow .... **Z. jonesii**
- 1b. Flower pedicelled
  - 3a. Perigone white .... **Z. drummondii**
  - 3b. Perigone yellow
    - 4a. Tepaltube about 5 mm. long .... **Z. pulchella**
    - 4b. Tepaltube 1.2-2 cm. long .... **Z. refugiensis**

Z. herbertiana Dietr. *(Z. brazosensis; Cooperia drummondii)*

Opening near sundown, white, very fragrant, tepaltube 6.5-10 cm. long; tepalsegs mostly about 2 cm. long. Frequent on most soils, sometimes in swales. June-October. Common over a large part of Texas.

Z. jonesii (Cory) Traub

Opening in mid-afternoon, light, yellow, fragrant; tepaltube usually 3-5 cm. long; tepalsegs mostly 1.5-2.5 cm. long. Frequent on the more poorly-drained soils, often in swales. July-October. An endemic of South Texas, known mostly from San Patricio and Refugio Counties; the type locality is about 18 miles south of the Refuge near Taft.

Z. drummondii D. Don *(Cooperia pedunculata)*

Opening in mid-afternoon, white, intensely fragrant; tepaltube about 4 cm. long; tepalsegs mostly 3.5-4 cm. long. Abundant on better-drained sandy and clayey loams on the Refuge. March-May. Widespread in Texas.

Z. pulchella J. G. Smith

Opening in the morning, orange-yellow, slightly fragrant; tepalsegs mostly 1.5—2.5 cm. long. Localized in swales on the Refuge. July-November. It ranges over South Texas from Victoria to Gonzales, Del Rio and Brownsville. The type locality is at Corpus Christi, about 25 miles south of the Refuge.

Z. refugiensis F. B. Jones

Opening in mid-morning, medium yellow, pleasantly fragrant; tepalsegs 1.8-2.5 cm. long. Known from a swale on the Refuge and perhaps not abundant. July-November. It is endemic to Refugio, Goliad and San Patricio Counties. The type locality is about 16 miles northeast of the Refuge near the city of Refugio.

HYMENOCALLIS. AMERINDIAN CHALICE LILY.

H. galvestonensis (Herb.) Baker *(H. liriosme)*

Leaves mostly 3-4 cm. wide; scape to 75 cm. tall; umbels 4-11-flowered; tepaltube 7-8 cm. long; tepalsegs 8-11 cm. long; staminal cup 2.5-3.5 cm. long; filaments 2.8-3.5 cm. long. Fairly frequent on low grounds subject to periodic flooding, mostly near the river. April-May. It ranges from Kleberg Co., Texas to Okla. and Ark. Interestingly, the Welder Refuge and other populations in South Texas are closer in some particulars, as in filament length, to *H. caroliniana* (L.) Herb., a S. E. U. S. species ranging as far west as Louisiana.

ALLIUM. WILD ONION.

1a. Bracts of the spathe 3-7-nerved; tepalsegs withering away as the capsule matures
  2a. Bulb without a cluster of small bulblets at base
    3a. Tepalsegs pink or lavender ....**A. canadense** var. **ecristatum**
    3b. Tepalsegs white ....**A. canadense** var. **fraseri**
  2b. Bulb with a cluster of stalked bulblets at base ....**A. elemendorfii**
1b. Spathe-valves 1-nerved; tepalsegs drying and persisting on the mature capsule ....**A. drummondii**

A. canadense L. var. *ecristatum* (M. E. Jones) Ownbey

Umbels mostly 8-20-flowered; tepalsegs 5-9 mm. long, pink, lavender or pale purple. Locally abundant, mostly on tight sandy loam. March-April. It is endemic to South Texas, known from a few stations lying roughly between Corpus Christi, Victoria and Floresville. The type locality is about 12 miles northwest of the Refuge near St. Paul.

A. canadense L. var. *fraseri* Ownbey

Umbels mostly 25-75-flowered; tepalsegs 5-6 mm. long, white. Known from the Refuge by a few small patches on tight sandy loam (F. B. Jones 6142, April 17, 1964). It ranges widely in Central Texas and northward and apparently has not previously been reported from so far south. Resembling it, but usually pink or lavender and often with a basal bulblet or two, is var. *mobilense* which occurs about 15 miles to the northeast and slightly farther away to the southeast. It may eventually be found on the Refuge.

A. drummondii Regel

Umbels mostly 10-20-flowered; tepalsegs 5-8 mm. long, white, pink, lavender or purple. Fairly common on better-drained sandy loams and clays. March-April. It is a wide-ranging species.

A. elmendorfi M. E. Jones ex Ownbey

Umbels mostly 15-25-flowered; tepalsegs about 5 mm. long, white or sometimes pinkish or lavender. Abundant on deep sands. March-April. It is endemic to South Texas, the few stations for it lying roughly between Corpus Christi and Elmendorf (just south of San Antonio.)

NOTHOSCORDUM. FALSE GARLIC

N. bivalve (L.) Britt.

Flowers opening near noon, white, fragrant; umbels mostly 6-11-flowered; tepalsegs usually 8-19 mm. long. Frequent on various soils on the Refuge. Flowering all year, but mostly March-June and September-October. Widespread in Texas.

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Trust Provisions from the Will of R. H. Welder Creating the Rob and Bessie Welder Wildlife Foundation. Mimeo.

NEW PUBLICATION

Lee Moore's Armchair Adventurer, Vol. 1, No. 1. Jan.-Feb. 1965 has been received. This first number of the new publication, founded and edited by the plant explorer, Mr. Lee Moore, P. O. Box 504, Kendall, Florida 33156, is dedicated to the memory of Ronald Wagner, who lost his life in an airplane crash while searching for new plants. The new periodical is devoted to the exploration for plants in the Amazonian jungles. Those interested in subscribing to this publication should write directly to Mr. Moore.

A WHITE GLORIOSA FROM AFRICA

Sydney Percy-Lancaster,

National Botanic Gardens, Lucknow, India

Since visiting Africa (see previous issues of Plant Life) I have been particularly interested in two genera—*Gloriosa* and *Sansevieria.* Of the former, a Bulletin (No. 123) has been issued by the National Botanic Gardens, Lucknow, in which are mentioned varieties collected by my son and self. Africa seems to produce the solitary *Gloriosa superba;* Africa has dozens. I brought back a few unnamed varieties of *Gloriosa* at the end of 1963, but only one has proved worth while waiting for it to get acclimatized. Caterpillars took advantage of casual supervision by an overseer and damaged the plants in 1964 and 1965. The entire collection was shifted to a new site and this new variety has been spared to grow to its full height and develop more than the solitary flower it bore last year. The variety has been named 'White Queen'. While it is certainly allied to the Carsonii Group, due to the arrangement of the foliage, the shape of the flower and the leaf is distinct.

Gloriosa—'White Queen'

Length of stem—15 feet.
First basal leaf—2 feet from ground.
Arrangement of foliage—irregular and occasionally alternate.
Leaf measurement—5″ by 1¼″, including tendril 1″ long; some leaves on main stem 6½″ by 2″.
Leaf color—dull green, under surface shining.
Leaf shape—oval, acute.
Flower bud—yellowish green, opening at the base.
Flower—length, 2″; width, 2½″, erect.
Petals—2″ long, ⅝″ wide, edges undulating.
Flower color—palest creamy white, with greenish base and dark maroon dots; fading to white with yellowish flush on the back of the petals, and to dead white on the second day.
Pistil 1½″ long, stamens 1¼″ long.
Number of flowers to the plant—approximately 25.
Flower pedicel—5″ to 7″ long.

KNIPHOFIA PRAECOX IN THE DEEP SOUTH

Claude W. Davis, *470 Delgado Drive,*

Baton Rouge, Louisiana 70808

The "discovery" of this "new", December flowering "Torch Lily" by the writer was more or less accidental. It came about through the receipt of a complimentary package of seed of the variety 'Winter Cheer' from R. E. Harrison & Company of New Zealand.

The seed germinated quickly and the seedlings grew lustily in a good loam soil in the open ground. After two years the plants bloomed in December, with fiery or flaming red spikes which were four feet tall and which stood out like sentinels in the garden.

A number of varieties of *Kniphofia praecox* are now available. 'Winter Cheer' has 9″, orange-scarlet torches on stems which are 3 to 4 feet tall. Each spike holds its color during the entire month of a frost-free December. The foliage of this plant is hardy in the Gulf Coast Region, but since freezes frequently come in December, it is advisable to grow the plants in 8″ pots which may be brought inside to protect the flowers from an over-night freeze.

Vegetative increase is rapid. The clumps may be divided after flowering and the divisions reset for bloom the following winter.

PLANT LIFE LIBRARY

PROCESSES OF ORGANIC EVOLUTION, by G. Ledyard Stebbins. Prentice-Hall, Inc., Englewood Cliffs, New Jersey. Concepts of Modern Biology Series. 1966. pp. 191. $2.50. Professor Stebbins is an expert in the field of evolutionary studies, having done much significant and original work as a student of evolutionary processes. Furthermore, Prof. Stebbins probably has a better command of the literature than any investigator now active in this demanding field. Familiarity with the literature permits him to pinpoint relevant examples from his own work and that of others for discussion and interpretation of specific problems.

There is no question about the niche this little volume (191 pages) is designed to occupy as Prof. Stebbins makes clear in the Preface. Essentially he proposes the book should: (1) serve to acquaint students and professional biologists in other fields with the "hows" and "whys" of evolution; and (2) serve as a basic platform for stimulating new advances into this fascinating field.

Reading this book is a rewarding experience. Stebbins writes well. His prose is trenchant, lively, and sparkles with pertinent analogies drawn from contemporary life. There is a pleasing absence of technical jargon, and where necessary to use such terms their meaning is carefully explained (sympatric vs. allopatric, pg. 94). The text is illustrated with an abundance of good figures, graphs, diagrams and photographs. It is a relief to read a scholarly book where subject matter and illustrations are so well integrated they occur on the same page. Teachers will find the Chapter Summary and the Questions for Thought and Discussion at the end of each chapter valuable aids in presenting the scope and meaning of evolution to their students.

There is little that can be faulted in this book; even the typographical errors are at a minimum. Confronted with this situation, the reviewer is reduced to making minor criticisms that have no bearing on the content, accuracy, or usefulness of the book. For example, the analogy on page 3 in my opinion is poorly chosen. The analogy of a group of evolutionary lines changing through time with an automobile being driven along the highway seems cumbersome and slightly exaggerated. Also, certain of the figures (e.g. Fig. 6-5) are not documented either in the legend or the text. This could be distracting to the motivated student seeking further information. Perhaps more copious references would have been an improvement, but this feature would have added materially to the length and cost of the book.

In a final chapter Prof. Stebbins analyzes what is known about the evolutionary processes in man, and boldly speculates on their meaning for the future of *Homo sapiens*. Sociologists, and even some geneticists are not likely to agree with his ideas, but they should stimulate some enlightening discussion in this important field.

For a lucid, concise discussion and explanation of the processes of organic evolution this little book is not likely to be surpassed, now or in the immediate future. In fact, it might well become a classic in this area.—*Thomas W. Whitaker*

PLANT LIFE LIBRARY—continued on page vi.

THE AMERICAN PLANT LIFE SOCIETY

For the roster of the general officers of the Society, the reader is referred to the inside front cover of this volume.

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[AMERICAN AMARYLLIS SOCIETY, continued from page 2.]

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This is required reading for every amaryllid enthusiast.

2. DESCRIPTIVE CATALOG OF HEMEROCALLIS CLONES, 1893—1948, by Norton, Stuntz, and Ballard. A total of 2695 Hemerocallis clones are included and also an interesting foreword, and explanatory section about naming daylilies. Manila covers; 100 pages (1—X; 1—90), includes a portrait of George Yeld. $5.00 postpaid.

3. **THE GENERA OF AMARYLLIDACEAE,** by Hamilton P. Traub. Includes a general introduction, a key to the subfamilies, infrafamilies, tribes, subtribes and genera of the Amaryllidaceae, and descriptions of all the genera. Every member of the Society should have this book for constant reference. Manila covers; publ. 1963; 85 pages. $5.00 postpaid.

4. **LINEAGICS,** Hamilton P. Traub, This is the first outline text for the undergraduate student on the grouping of organisms into lineages. The text is divided into four parts: (a) the history of lineagics and lineagics as an integrated science; (b) basic lineagics, principles and procedures; (c) applied lineagics, principles and procedures; and (d) research methods in lineagics. Recommended for the student in biology. Publ. 1964. Manila covers, 163 pages, incl. 8 illus. $5.00 postpaid.

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REVIEW OF THE GENUS NERINE

by

Hamilton P. Traub

1967

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REVIEW OF THE GENUS **NERINE** HERB.

HAMILTON P. TRAUB

I. BRIEF HISTORY, 1820-1966

The story is told that a trading ship was wrecked off the British Channel Islands and that among the wreckage that washed-up on the shores were bulbs from a foreign land which took root and thrived. Thus, apparently before 1700, a plant commonly known as the "Guernsey Lily" had been naturalized on the Island of Guernsey (Latin,—Sarnia) through the agency of the early traders. At that time, the South African habitat of the plant was unknown. When Linnaeus published "Species Plantarum" in 1753, he included it under the name, *Amaryllis sariensis* L. (=Amaryllis of Sarnia). In the same year, Heister (Braunsvig. 20. 1753; 1755) had placed this plant under the generic name, *Imhofia* Heist. Herbert later ignored Heister's name, and first proposed *Galatea* Herb. in 1820, a later homonym, which he subsequently replaced it with *Nerine* Herb. (Bot. Mag. Pl. 2124. 1820). This was later conserved over the earlier *Imhofia* Heist. Thus, the species are now grouped under the later name, *Nerine* Herb. (nomenifer, or name-bearer, the species *Nerine sarniensis* (L.) Herb.).

In a later edition of "Species Plantarum", the species *Amaryllis undulata* L., was proposed which was referable to *Nerine.* The great naturalist, Nicolaus Joseph Jacquin (1727—1817) proposed four additional species which were referable to *Nerine—Amaryllis marginata, A. curvifolia, A. humilis,* and *A. flexuosa. Amaryllis corusca, A. venusta,* and *A. laticoma* were added by Ker-Gawler.

In 1821, Herbert recognized nine species—*Nerine curvifolia, corusca, rosea, venusta, sarniensis, flexuosa, humilis, undulata* and *pulchella.* In 1837, Herbert again listed nine species, but unfortunately he placed *N. sarniensis* under *N. venusta* as a variety as shown in Table 1.

Baker, in 1888, admitted 10 species, and by 1896, he listed fifteen species as shown in Table 1.

From 1896 to 1966, twenty-one species have been added. Of these, nine, including two varieties later raised to specific rank, were proposed by Winsome F. Baker. Another five species were described by L. Bolus, and one each of the remaining seven species were proposed by various other authors. Thus, as of 1966, thirty-six species were recognized. This number has been reduced to thirty in the present review. Others apparently remain to be discovered. However, it has to be realized that some of the species now recognized, after critical study, may be reduced to synonymy or to subspecific rank.

The biological Latin name, *Nerine,* is from the Greek, *Nereis,* the name of a sea-nymph. The so-called Roman pronunciation of Latin aims to represent approximately the pronunciation of classical time: *e* as in *pet; i* as in *machine.* Words of more than one syllable are accented on the penult (=last syllable but one) if that is long. Thus, *Nerine* would be

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pronounced *ne-reé-ne.* But Roman names in common usage today are sometimes pronounced with ordinary English sounds, *i* as in *ice.* Thus, it would be pronounced *ne-ryé-ne.* This is altogether too harsh for a flower named for a sea-nymph. Thus it is clear that the pronounciation should follow the classical Latin, *ne-reé-ne.*

Table 1. The species of **Nerine** according to Herbert (1821) and (1837).

SPECIES AS OF 1821

1. **curvifolis** (Jacq.) Herb. Bot. Mag. 725
2. **corusca** (Kew-Gawl.) Herb. Bot. Mag. 1089
3. **rosea** Herb. Bot. Mag. 2124
4. **venusta** (Kew-Gawl.) Herb. Bot. Mag. 1090
5. **sarniensis** (L.) Herb.
6. **flexuosa** (Jacq.) Herb. Bot. Mag. 172
7. **humilis** (Jacq.) Herb. Bot. Mag. 726
8. **undulata** (L.) Herb. Bot. Mag. 369
9. **pulchella** Herb.

SPECIES AS OF 1837

1a. Perigone regular; filaments and style fascisculate, straighter:
  2a. Umbel centripetal:
    1. **marginata** (Jacq.) Herb.
    2. **curvifolia** (Jacq.) Herb. Bot. Mag. 725
    3. **corusca** (Ker-Gawl.) Herb. Bot. Mag. 1089
  2b. Umbel centrifugal:
    4. **venusta** (Ker-Gawl.) Herb. Bot. Mag. 1090
      var. **sarniensis** (L.) Herb. Bot. Mag. 294
      var. **rosea** (Herb.) Herb. Bot. Mag. 2124
      var. **minor** Herb.
1b. Perigone distorted; filaments and style curved upwards:
  3a. Umbel centripetal:
    5. **flexuosa** (Jacq.) Herb. Bot. Mag. 172
    6. **pulchella** Herb. Bot. Mag. 2407
    7. **lucida** (Burch.) Herb. Bot. Mag. 2124
  3b. Umbel centrifugal:
    8. **humilis** (Jacq.) Herb. Bot. Mag. 726
    9. **undulata** (L.) Herb. Bot. Mag. 369

Table 2. The species of **Nerine** according to Baker (1896).

1a. Scape long, slender:
  2a. Tepalsegs, stamens and style nearly erect:
    1. **sarniensis**
    2. **curvifolia**
    3. **moorei**
  2b. Tepalsegs, stamens and style declinate:
    3a. Filaments not distinctly appendiculata at the base:
      4. **flexuosa**
      5. **angustifolia**
      6. **pudica**
      7. **brachystemon**
      8. **filifolia**
      9. **undulata**
      10. **humilis**
    3b. Filaments distinctly appendiculata at the base:
      11. **appendiculata**
      12. **pancratioides**
1b. Scape short, stout:
    13. **lucida**
    14. **duparquetiana**
    15. **marginata**

The present review of the genus *Nerine* Herb., is a lineagic treatise and is excerpted from the large text of all the *Amaryllidaceae* on which the writer has been working for over a half century. It is reproduced at this time at the request of members of the Society interested in Nerines and will tide them over until the monograph of Prof. Ken Douglas of Kingswood College, Grahamstown, South Africa, can be completed and published. Such a monograph can include also details on breeding, culture, pest control, etc.

II. THE GENUS **NERINE**

Genus NERINE Herb.,

Bot. Mag. pl. 2124. 1820; App. 18-19. 1821; Amaryll. 283-287. 1837; Bak., Gard. Chron. 779-810. 1885; Amaryll. 99—103. 1888; Fl. Cap. 208—215. 1896.

Syn.—*Imhofia* Heist., Braunsvig. 20. 1753; 1755; *Galatea* Herb., Bot. Mag. sub pl. 2113. 1820; *Laticoma* Raf., Fl. Tellur. 4: 12. 1836 (1837); *Loxanthes* Salisb., Gen. Pl. 117. 1866.

Bulb tunicated, sometimes continued into a neck; *leaves* tongue-shaped (lingulate), or linear-lorate, or linear, or subterete, or filiform, synanthous or hysteranthous; *scape* robust, or slender; *spathe-values* 2, variously shaped; *umbel* few- to many-flowered; *perigone* fairly regular to markedly irregular, variously colored white, red, pink, magenta, mauve, wine-red, etc.; *ovary* 3-valved, ovules few per cell; *tepaltube* short or very short; *tepalsegs* subequal or equal, variously shaped, hardly at all or more or less crisped; *stamens* suberect or declinate-ascending, 3 shorter than the other 3, filiform, usually thickened at the base, or appendiculate, or alternating with scales, or forming a staminal cup, at the base; anthers oblong, dorsifixed, versatile, *style* filiform, straight, or declinate-ascending, stigma simple or 3-lobed; *capsule* membranous, loculicidally 3-valved, variously shaped, often rupturing by the expansion of the maturing seeds; seeds few per locule, globose.

Range.—southern Africa: Republic of South Africa (R. S. Afr.), Botswana, Lesotho, and Swaziland. One species is naturalized on the Island of Guernsey.

LINEAGIC POSITION

The genus *Nerine* Herb., is a member of the Tribe *Crineae* (see Traub, The Genera of Amaryllidaceae, 1963; and Traub, Introduction to Herbert's Amaryllidaceae, etc., 1967) to which belong also the genera *Ammocharis, Boophone, Crinum, Hessea, Strumaria, Brunsvigia* and *Cybistetes*. Species of *Crinum* have been crossed with those of *Brunsvigia* (= X *Crinodonna* Ragin. ex Stapf); and species of *Brunsvigia* have been crossed with those of *Nerine* (= X *Brunserine* Traub). It is evident that *Nerine* is most closely related to *Brunsvigia* and *Crinum* on the basis of crossing experiments carried on up to the present. However, crossing experiments with species of the other genera should also be attempted in order to determine the limits of genetic compatibility within the tribe. Morphologically, some *Nerine* species resemble those of *Hessea* in some particulars, but crossing experiments are needed to follow up this lead.

Due to the close relationship of *Nerine* to *Brunsvigia*, it is possible that at some future date, the two genera may have to be united on biological grounds. For the present, it is best to maintain *Nerine* as a separate genus.

ECONOMIC IMPORTANCE

At present the economic importance of *Nerine* resides entirely in the value of these species and hybrids (a) as outstanding ornamental garden and pot plant subjects; and (b) as the basis of cut flowers for the florist's trade.

In the future, the alkaloids found in the tissues of these plants may also be of some importance in medicine. The alkaloids reported in these plants as summarized by Hegnauer (1963) include brunsvigin (syn.-ambellin), caramin, crinin, crispin, falcatin, flexuosin, krigein, lycomin, neronin, tazettin, undulatin, and vittatin (see Hegnauer, R.: Chemotaxonomie der Pflanzen. 2: 59. 1963).

CARYOLOGY

The study of the chromosome numbers and chromosome morphology, the behavior of the chromosomes during meiosis, etc., (known as the science of caryology), has only begun in *Nerine*. A number of workers have reported mainly on chromosome numbers in 15 out of a total of presently recognized 30 species as shown in Table 2. It is hoped that studies on the remaining species can be undertaken also. The published results indicate that the basic number is x=11, with diploid numbers usually 2n=22, rarely 2n=24. In a number of cases triploids, 2n=33, have been reported.

Table 2. The genus **Nerine** Herb.: reported chromosome numbers of some species.

	2n number	Authority
SECTION I. **LATICOMAE,** x=11		
marginata	22	Janaki Ammal (1951)*
laticoma (as **lucida**)	22	Janaki Ammal (1951)*
laticoma	22	Gouws (1949)**
duparquetiana	22	Gouws (1949)**
SECTION II. **NERINE,** x=11, 12		
sarniensis	22, 24, 33	Janakai Ammal (1951)
sarniensis var. **corusca major**	22	James & Addicott (1941)#
sarniensis var. **rosea** (as **Nerine rosea**)	22	Muller (1912)##
sarniensis var. **moorei**	33	Janaki Ammal (1951)
sarniensis var. **curvifolia**	22, 24	Janaki Ammal (1951)
curvifolia f. **fothergillii major**	24	James & Addicott (1941)
SECTION III. **BOWDENIAE,** x=11, 12		
bowdenii	22, 24	Janaki Ammal (1951)
flexuosa	22, 33	Janaki Ammal (1951)
flexuosa var. **alba**	22	James & Addicott (1941)
undulata	22, 33	Janaki Ammal (1951)
pudica	22, 33	Janaki Ammal (1951)
angustifolia	22	Janaki Ammal (1951)
filifolia	22, 24	Janaki Ammal (1951)
falcata	22	Gouws (1949)
humilis	22, 33	Janaki Ammal (1951)

SECTION IV. **APPENDICULATAE**, x=11, 12

appendiculata	22	Janaki Ammal (1951)
masonorum	22	Janaki Ammal (1951)
	24	Gouws (1949)
frithii	22	Gouws (1949)

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* Janaki Ammal, E. K.: J. R. Hort. Soc. 76: 365. 1951

** Gouws, J. B.: Plant Life 5: 54. 1949

# James, W. M. & F. T. Addicott: Herbertia 8: 111-116. 1941

## Muller, C.: Arch. Zellforsch. 8: 1—51. 1912.

In one hybrid, 'Inchmery Kate', the chromosome number is reported as tetraploid, 2n=44 (see Janaki Ammal, J. Roy. Hort. Soc. Oct. 1951). To date, tetraploids have not been revealed in nature, but when the remaining species are studied it may be possible to show that tetraploids may also occur among wild species.

LINORDINATION OF NERINE SPECIES

Herbert (1837) grouped the *Nerine* species known to him into (1) Regulares: perigone regular, filaments and style fascisculate, straighter; and (2) Irregulares: perigone distorted, filaments and style curved upwards, as shown in Table 1, above. Under these two classes he grouped the species under (a) umbel centripetal, and (b) umbel centrifugal. This is an artificial grouping and was not adopted by Baker (1888; 1896) who dispensed with subgroups as shown in Table 1, above.

In the present review, the species of *Nerine* are grouped under four sections. These are named and characterized briefly in the following key:

KEY TO THE SECTIONS OF **NERINE**

1a. Stamen-filaments thickened at the base, but not distinctly appendiculate, or otherwise modified at the base:
  2a. Scape usually short, stout:

Section I. **LATICOMAE** Traub, **sect. nov.**

Filamentis staminorum basi non manifeste appendiculatis; scapo crasso brevi Nomenifer: **Nerine laticoma** (Ker-Gawl.) Th. Dur. & Schinz, Consp. Fl. Afr. 5. 1893.

  2b. Scape usually longer, slender:
    3a. Perigone, stamens and style nearly straight:

Section II. **NERINE**

Filamentis staminorum basi non manifeste appendiculatis: scapo longo gracili; perigonio staminibusque styloque paene erectis. Nomenifer: **Nerine sarniensis** (L.) Herb. Bot. Mag. sub pl. 2124. 1820.

    3b. Perigone, stamens and style declinate:

Section III. **BOWDENIAE** Traub, **sect. nov.**

Filamentis staminorum basi non manifeste appendiculatis: scapo longo gracili; perigonio staminibusque styloque declinatns. Nomenifer: **Nerine bowdenii** W. Watson, Gard. Chron. vol. 36, p. 365.1904.

1b. Stamen-filaments distinctly appendiculate at the base, or alternating with scales, or forming a short staminal cup at the base:

Section IV. **APPENDICULATAE** Traub, **sect. nov.**

Filamentis staminorum basi distincte appendiculatis, vel squamis alternatis, vel basi cupulam staminalem constituentibus. Nomenifer: **Nerine appendiculata** Bak., in Gard. Chron. ii(1894)336.

According to the International Code of Nomenclature, the section which accomodates the nomenifer (name bearing element of the genus, Section II. *Nerine*) has to bear the same name as the genus and does not require an author.

KEY TO THE SPECIES OF **NERINE**

In the following key, 30 recognized species are grouped under the four sections of the genus as explained above. As already indicated, some of these may later be reduced to synonymy after further study. However, such changes have to be based upon solid evidence. Additional species may be discovered in the future. Prof. Ken Douglas, in a private communication, has indicated that he has discovered two new species which will be described later.

In the present review, the somewhat atypical species have been grouped under Section I. *Laticomae.*

(a) *Nerine marginata* apparently has inherited obvious *Brunsvigia* genes that determine the tongue-shaped leaf form, but the genes which are responsible for the flower form indicate an independent line of evolution since the flowers differ from those of *Brunsvigia* and the typical *Nerine.*

(b) The *laticoma-complex,* including five proposed species with synanthous bright green leaves and compressed scapes show slight variation. *N. laticoma* and *N. huttoniae,* with relatively shorter scapes, apparently inherited from a common ancestral stock shared with *Brunsvigia,* most closely resemble species in that genus. *N. flexuosa* var. *sandersonii* and *N. falcata,* with still longer scapes, and more delicate flowers, show still farther divergence from *Brunsvigia. N. krigei* with relatively long scapes only 5 mm. in diameter, comes even closer to the typical Nerines.

Finally, (c), *N. duparquetiana,* similar to the species of the *laticoma-complex* in some particulars, shows still another step in the direction of the typical Nerines in the minute pubescens on the scape and pedicels.

Apparently, the proper disposition of the five groups in the *laticoma-complex* is to consider those proposed later as subspecies under the namebearer, *N. laticoma,* which happens to show the extreme variation in the direction of *Brunsvigia.*

The remaining typical *Nerine* species have been grouped under the three sections: Section II. *Nerine,* Section III. *Bowdeniae* and Section IV. *Appendiculatae* as already indicated.

KEY TO THE SECTIONS AND SPECIES

1a. Wild species:
  2a. Stamen-filaments usually thickened below, but **not** distinctly appendiculate or otherwise modified, at the base, except for fleshy scales at the

base in **N. laticoma** subsp. **huttoniae:**
3a. Scape relatively short, stout, compressed:

Section I. LATICOMAE Traub

4a. Leaves tongue-shaped (lingulate), prostrate, hysteranthous; scape 15 cm. long, tepalsegs 3 cm. long, bright scarlet. R. S. Afr.: Cape Province ....1. **marginata**
4b. Leaves strap-shaped (lorate), synanthous, usually with a half twist in upper part; sometimes falcate:
5a. Scape and pedicel smooth; R. S. Afr.: Cape Province, Damaraland, Avamboland, Transvaal, Orange Free State . . . 2. **Laticoma**
6a. Scape relatively shorter, 7.5—30 cm. long:
7a. Scape 7.5—20 cm. long, 9 mm. in diam.; umbel many-flowered; tepalsegs pale pink, or bright red, with deeper band in center ....2a. **laticoma** subsp. **laticoma**
7b. Scape 15—30 cm. long, 1 cm. in diam., umbel very many-flowered; tepalsegs pink with dark red or brown mid-vein; quadrate scales at the base of the tepalsegs. R. S. Afr.: Cape Province ....2b. **laticoma** subsp. **huttoniae**
6b. Scape relatively longer, 36—43 cm. long:
8a. Scape 1.2 cm. in diam.; leaves 2.7—3 cm. wide, umbel 20—25—flowered:
9a. Leaves not falcate; tepalsegs 4 mm. wide. R. S. Afr.: Transvaal ....2c. **laticoma** subsp. **sandersonii**
9b. Leaves leathery, falcate; flowers more dainty in shape and more delicate in color; tepalsegs 4.5 cm. long, 5 mm. wide, white, rose pink at the apex. R. S. Afr.: Transvaal ....2d. **laticoma** subsp. **falcata**
8b. Scape 5mm. in diam.; leaves narrower, 1.2 cm. wide; Tepalsegs rose-pink with green keel, R. S. Afr.: Transvaal ....2e. **laticoma** subsp. **krigei**
5b. Scape and pedicels covered with a minute pubescens; scape 7—8 mm. in diam.; umbel 15—20-flowered; tepalsegs white; flushed shell-pink at the face, and with a green keel. R. S. Afr.: Cape Province ....3. **duparquetiana**
3b. Scape relatively more slender
10a. Perigone, stamens and style nearly erect (see also **N. filamentosa** and **N. rehmannii** under Sect. III); leaves 1.2—2 cm. wide:

Section II. NERINE

11a. Tepalsegs hardly at all crisped:
12a. Leaves glabrous green, suberect; R. S. Afr.: Cape Province ....4. **sarniensis**
13a. Flowers bright crimson . . . . 4a. **sarniensis** var. **sarniensis**
13b. Flowers not **bright** crimson:
14a. Flowers duller crimson or bright scarlet:
15a. Flowers duller crimson . . 4b. **sarniensis** var. **plantii**
15b. Flowers bright scarlet:
16a. Flowers produced earlier than in other varieties ......4c. **Sarniensis** var. **venusta**
16b. Leaves broader than in type 4d. **sarniensis** var. **corusca**
14b. Flowers rose-colored or white:
17a. Flowers rose-colored . . 4e. **sarniensis** var. **rosea**
17b. Flowers white (Table Mountain) 4f. **sarniensis** var. **alba**
12b. Leaves glaucous, falcate. R. S. Afr.: Cape Prov. ....4g. **sarniensis** var. **curvifolia**
18a. Plant less robust ......4g-a. **sarniensis** var. **curvifolia** f. **curvifolia**

18b. Plant more robust in all its art ....4g-b. **sarniensis** var. **curvifolia** f. **fothergillii**

11b. Tepalsegs distinctly crisped. R. S. Afr. habitat unknown ....4b. **sarniensis** var. **moorei**

10b. Perigone, stamens and style declinate; tepalsegs usually more or less crisped, except in **N. filamentosa** and **N. rehmannii:**

Section III. **BOWDENIAE** Traub

19a Leaves unknown; perigone white; umbel 3—5-flowered; stamens as long as the tepalsegs. R. S. Afr.: Natal ...5. **schlecteri**

19b. Leaves known:

20a. Leaves lanceolate, obtuse, umbel 1—5-flowered:

21a. Leaves prostrate, 8 mm. wide, hysteranthous, spathe-valves reddish purple; perigone rose-pink. R. S. Afr.: Cape Province ....6. **breachiae**

21b. Leaves not prostrate, synanthous. 1.3—2 cm. wide; spathe-valves pink; perigone pale pink. R. S. Afr.: locality unknown ....7. **rydleyi**

20b. Leaves linear-lorate, linear, subterete or filiform:

22a. Leaves linear, or linear-lorate; bright green or glaucous:

23a. Leaves linear-lorate, 1.5—3 cm. wide; bright green:

24a. Leaves hysteranthous, 1.5—3 cm. wide; tepalsegs rose-pink, deeper mid-rib, to 6—7.5 cm. long. R. S. Afr.: ....8. **bowdenii**

24b. Leaves synanthous, 1.5—2 cm. wide, tepalsegs pale pink, 2.5—3 cm. long. R. S. Afr.: Cape Province ....9. **flexuosa**

25a. Leaves bright green:

26a. Typical form ......9a. **flexuosa** var. **flexuosa**

26b. Flowers white ....9b. **flexuosa** var. **alba**

25b. Leaves glaucous; tepalsegs pink, pink with a rose-red keel ....9c. **flexuosa** var. **pulchella**

23b. Leaves linear, 3—13 mm. wide, synanthous, except hysteranthous in **N. alata** and **N. humilis** subsp. **fera:**

27a. Leaves bright green, except glaucous in **N. humilis** subsp. **fera.**

28a. Leaves 3—5 mm. wide:

29a. Umbel 6—12-flowered; perigone magenta-colored. R. S. Afr.: Cape Prov., Orange Free State, Natal, Transvaal. Botswana and Swaziland ....10. **angustifolia**

29b. Umbel 6—12-flowered; perigone mauve-pink. R. S. Afr.: Cape Prov. ....11. **Alata**

28b. Leaves 6.4—13 mm. wide:

30a. Tepalsegs 1.7—2 cm. long, pale pink. R. S. Afr.: Cape Prov., Orange Free State, and Damaraland ————12. **undulata**

31a. Tepalsegs much crisped ..12a. **undulata** var. **undulata**

31b. Perigone larger and less crisped 12b. **undulata** var. **major**

30b. Tepalsegs 2.5—3 cm. long, bright pink or rose-red. R. S. Afr.: Cape Prov. ....13. **humilis**

32a. Leaves bright green, 1.3 cm. wide 13a. **humilis** subsp. **humilis**

32b. Leaves glaucous, 8 mm. wide R. S. Afr.: Cape Prov. ....13b. **humilis** subsp. **fera**

27b. Leaves glaucescent or glaucous, except bright green in **N. pudica** var. **elwesii:**

33a. Leaves glaucescent, 7—12 mm. wide; spathe 4.5 cm. long, dark reddish-purple; perigone carmine, pale above. R. S. Afr. Cape Prov. ......14. **peersii**
33b. Leaves glaucous, 6—8.5 mm. wide; spathe 2.5—3.8 cm. long. R. S. Afr.: locality unknown 15. **pudica**
34a. Perigone white with pink keel .15a. **pudica** var. **pudica**
34b. Perigone pale rose or white:
35a. Perigone pale rose, with deeper keel; leaves bright green ....15b. **pudica** var. **elwesii**
35b. Perigone pure white ..15c. **pudica** var. **alba**
22b. Leaves subterete or filiform:
36a. Leaves subterete:
37a. Umbel 6—20-flowered:
38a. Leaves 1.5 mm. in diam., umbel 10—20-flowered; perigone bright red, spathe 3.8—5 cm. long. R. S. Afr.: Cape Prov. ....16. **brachystemon**
38b. Leaves 2 mm. in diam., umbel 6—9-flowered; perigone bright rose; spathe nearly 7 cm. long. R. S. Afr.: Cape Prov. ....17. **filamentosa**
37b. Umbel 3—5-flowered; perigone white, rose in lower part; spathe 2 cm. long; leaves 2 mm. in diam. R. S. Afr.: Damaraland ....18. **pusilla**
36b. Leaves filiform, 1—2 mm. wide:
39a. Spathe ovate, acute or oblong, lanceolate, acute:
40a. Leaves 4—5, umbel 2—3-flowered; pedicels glabrous. R. S. Afr.: Cape Prov. ......19. **tulbaghensis**
40b. Leaves 1, rarely 2, umbel about 9-flowered; pedicels pubescent; R. S. Afr.: Transvaal . . 20. **rehmannii**
39b. Spathe-valves lanceolate:
41a. Umbel 8—12-flowered; leaves synanthous; tepalsegs rose-pink. R. S. Afr.: Orange Free State . . 21. **filifolia**
41b. Umbels 3—8 flowered; leaves hysteranthus; tepalsegs bright mauve-pink. R. S. Afr.: Cape Prov. ————22. **parviflora**
2b. Filaments variously appendiculate, or otherwise modified at the base; or filaments alternating with scales at the base; (see also **N. laticoma** subsp. **huttoniae** under Section I., above):

Section IV. **APPENDICULATAE** Traub

42a. Scape and/or pedicels **not** pubescent;
43a. Leaves 1—2 mm. wide:
44a. Umbels 5—7-flowered; leaves subfiliform:
45a. Filaments appendiculate at the base forming a staminal cup. R. S. Afr.: Cape Prov. and Orange Free State 23. **frithii**
45b. Filaments appendiculate at the base, forming a staminal cup, with lacerate lobes. R. S. Afr. ......24. **transvaalensis**
44b. Umbel 6—20-flowered; leaves linear; filament appendages almost free to the base, somewhat spreading. R. E. Afr.: Cape Prov. ....25. **hesseoides**
43b. Leaves terete, 1 mm. in diam.; tepalsegs wine red, 1.7 cm long, 2 mm. wide. Botswana ....26. **gaberonensis**
42b. Scape and/or pedicels **pubescent:**
45a. Perigone pure white; stamens alternating with square scales. R. S. Afr.: Natal ....27. **pancratiodes**
45b. Perigone **not** pure white:
46a. Perigone pale to deep rose, deeper mid-vein; filament appendages conspicuous, white. R. S. Afr.: Natal ....28. **appendiculata**
Perigone rose-pink:
47a. Tepalsegs rose-pink, with darker central stripe; filament appendages lanceolate. R. S. Afr.: Cape Prov. ....29. **masonorum**

47b. Tepalsegs rose-pink, keeled green above the middle; filament appendages behind the base. R. S. Afr.: Transvaal 30. **gracilis**

1b. **Nerine** hybrids

Section I. **LATICOMAE** Traub

Scape relatively short, stout; stamen-filaments not distinctly appendiculate or otherwise modfied, at the base, except for fleshy scales at the base in *N. laticoma* subsp. *huttoniae.* Nomenifer: *N. laticoma* (Ker-Gawl.) Th. Dur. & Schinz.

1. Nerine marginata (Jacq.) Herb. Amaryll. 283. 1837; Bak. Amaryll. 102. 1888; Dyer, Plant Life 6: 67—69, pl. 7. 1950.

Syn.—*Amaryllis marginata* (Jacq.) Hort. Schoenbr. 1: 34, pl. 65. 1797; *Brunsvigia marginata* (Jacq.) Ait. Hort. Kew, ed. 2. 2: 230. 1810-1813; Ker-Gawl., Bot. Mag. sub pl. 1443. *Imhofia marginata* (Jacq.) Herb. App. 18. 1821; *Elisena marginata* (Jacq.) Roem. Syn. Monogr. Amaryll. 4: 63. 1847.

Bulb ovoid, 4—5—7.6 cm. in diam., tunics dark brown, membranous. *Leaves* 4, produced after the flowers, spreading on the ground, obovate-oblong or long lingulate, obtuse, 15—25 cm. long, 5—6.5—7 cm. wide, with a reddish crisped cartilagenous margin. *Scape* stout, compressed, 12—15—20 cm. long, 1 cm. in diam. *Spathe* 2-valved, deltoid, 2—3 cm. long, shorter than the pedicels. *Umbel* 12—20-flowered, centripetal; perigone more or less regular, erect, bright scarlet. *Pedicels* 3.8—5—7 cm. long. *Ovary* moderately 3-angled, turbinate, 1—1.5 cm. long, 6 mm. in diam. across the angles. *Tepaltube* very short, 5—7 mm. long. *Tepalsegs* lanceolate, 3 cm. long, 6.5 mm. wide, spreading, recurved, slightly undulate on the margins. *Stamens* suberect, nearly straight, a little longer than the tepalsegs; anthers oblong, 6—8 mm. long. *Style* straight, a little longer than the stamens. *Capsule* up to 2 cm. long, 1.5 cm. in diam.

Range.—R. S. Afr. Cape Province: Tulbagh, Wellington, Ceres Paarl.

Notes.—*Nerine marginata* has leaves similar to species of the subgenus *Brunsvigia,* genus *Brunsvigia,* and flowers unlike the typical flowers of either *Nerine or Brunsvigia.* It is apparently closely related to *Brunsvigia.*

2. Nerine laticoma (Ker-Gawl.) Th. Dur. & Schinz, Consp. Fl. Afr. 5 (1893); 256. (1895).

Syn.—*Amaryllis laticoma* Ker-Gawl., in Bot. Reg. 6: pl. 497. 1820-21; *Amaryllis lucida* Burchell, Travels 1: 536. 1822; D. Dietr. Syn. Pl. 2: 1181. 1839-52; *Nerine lucida* (Burch.) Herb., in Amaryll. 283, pl. 26, fig. 3. 1837; Bak. Amaryll. 102. 1888; Fl. Cap. 6(2): 214. 1896; Pole Evans, Fl. Pl. S. Afr. 4: pl. 134. 1924; *Imhofia lucida* (Burch.) Kuntze, Rev. Gen. 704. 1891; *Imhofia laticoma* (Ker-Gawl.) Schinz, in Bull. Herb. Boiss. 4: App. 3. p. 46.

Bulb globose, 4—(7.5—10) cm. in diam.; bulb-neck about 4 cm. long. *Leaves* 6—8, produced in summer and persisting at flowering time in autumn, strap-shaped (linear), obtuse, bright green, 18—30—36 cm. long, 1.2—(1.8—2) cm. wide. *Scape* lateral, moderately stout, compressed, with rounded edges, 7.5—10—12—20 cm. long, 6x9 mm. in diam. *Spathe* values ovate-lanceolate, membranous, 4 cm. long. *Umbel* 19—20—22(—40)-flowered, centripetal; perigone 3.8—4—4.2—(5) cm. long, pale pink, or bright red with narrow deeper-colored band in center of the tepalsegs. *Pedicels* 4.5—7.6—8—10 cm. long, stiff, moderately stout. *Ovary* obtusely-trigonous, 5—6.5 mm. long, 11 mm. in diam. *Tepaltube* 3 mm. long, 4 mm. in diam. (base), 5 mm. in diam. (apex). *Tepalsegs* lanceolate-linear, obtuse, 3.7—3.8 cm. long, 6—6.5 mm. wide, hardly at all crisped. *Stamens* declinate, nearly as long as the tepalsegs; filaments bright red; anthers oblong, 3—4 mm. long. *Style* bright red, declinate-ascending, as long as the stamens; stigma capitate. *Capsule* depresso-globose, 8—13 mm. in diam.

Range.—R. S. Afr.: Western portions of Cape Province; Damaraland and Avamboland; Transvaal, Orange Free State.

Notes.—*Nerine laticoma* resembles a dwarf *Brunsvigia* in general habit, but differs from that genus by the obtusely angled ovary and the less zygomorphic perigone. The relatively stout scape is also present in the three other subspecies of *Nerine laticoma.* The scape is relatively longer in plants grown under good garden culture.

The above description was checked against the existing ones, and includes the data from living cultivated plants, and the herbarium specimen No. 1055 (TRA), La Jolla, Calif. 7-18-63.

2b. NERINE LATICOMA subsp. HUTTONIAE Traub, COMB. NOV.

Syn.—*Nerine huttoniae* Schoenland, Rec. Alb. Mus. 1: 49. 1903 as *N. huttonii;* Dyer, in Fl. Pl. S. Afr. 29: pl. 1130. 1952.

Bulb ovoid, up to about 4 cm. in diam.; tunics membranous, pale brown. *Leaves* 7—10, produced with the flowers, subdistichous, lorate, 1—2 cm. wide, thin, and up to about 30 cm. long, shiny, finely ribbed, obtuse when young, but tip withers with age in its natural habitat; concave along the upper side; ascending in the lower half, recurved above. *Scape* green, arising from outside the leaves (lateral), 15—30 cm. long, 1 cm. in diam., flattened. *Spathe-valves* 2, dry, brown, ovate, cuspidate, about 3.5 cm. long. *Umbel* 20—75-flowered, may average nearly 40, pedicels arising from 3 extremely short growing points in the umbel; with the flowers from each growing point opening from the outside or base, giving the impression of a random opening of the flowers throughout the umbel. *Pedicels* angled, straight or slightly curved towards the flower, usually 8—12 cm. long. *Ovary* 3-angled. *Perigone* with very short tepaltube, 2.5—3.2 cm. long, the size probably depending somewhat on the number of flowers in the umbel; tepalsegs pink with dark red to brown mid-vein, oblanceolate-linear, spreading, recurved, slightly undulate. *Stamens*: filaments slightly shorter than the tepalsegs, red, with small lateral appendages at the base, and thickened dorsally; anthers reddish-brown, about 6 mm. long, turning black. *Style* red, about as long as the stamens. *Seeds* as large as peas, nearly globular.

Range.—Cape Province: Great Fish River Valley, near Craddock to Committees; near Sheldon.

Notes.—Named for Mrs. Hutton. Closely related to *N. laticoma,* but habitats are fairly widely separated.

2c. Nerine laticoma subsp. sandersonii (Bak.) Traub, comb. nov.

Syn.—*Nerine flexuosa* var. *sandersonii* Bak., Amaryll. 101. 1888; Fl. Cap. 6: 211. 1896; Pole Evans, in Fl. Pl. S. Afr. 4: pl. 139. 1924.

Bulb globose, 7 cm. in diam. *Leaves* about 7, usually twisted, 30 cm. long, 2.7 cm. wide, strap-shaped. *Scape* up to 40 cm. long, elliptic in cross-section (compressed with sharp edges). *Spathe-values* ovate, acuminate, 4 cm. long. *Umbel* about 25-flowered. *Pedicels* up to 7 cm. long, slender. *Ovary* globose, obscurely 3-angled. *Tepaltube* short. *Tepalsegs* crisped in the upper half, about 4 cm. long. *Stamens* declinate; filaments almost as long as the tepalsegs (when mature). *Stigma* simple.

Range.—R. S. Afr.: Transvaal.

2d. Nerine laticoma subsp. falcata (Barker) Traub, subsp. nov.

Syn.—*Nerine falcata* Barker, in Fl. Pl. S. Afr. 13: pl. 511. 1933.

Bulb globose, 5—7 cm. in diam. *Leaves* 5—7, appearing with the flowers, falcate, erect or patent, with a half spiral twist, dark green, margins scabrous, 26 cm. long, 3 cm. wide, apex obtuse. *Scape* angular, 43 cm. long, 1.3 cm. in diam. *Spathe-valves* oblong, 4.8 cm. long, 1.8 cm. wide, membranous. *Umbel* 20—25 flowered, centripetal. *Pedicels* 9 cm. long, 2—3 mm. in diam. *Perigone* zygomorphic, the lower tepalsegs diverging widely from the stamens, 5—6 cm. in diam; tepalsegs *white,* patent, then recurved, linear acute, slightly undulate towards the apex and *rose-pink,* 4.5 cm. long, 5 mm. wide. *Stamens* declinate, filaments 3.2 cm. long, rose pink. *Ovary* obtusely angular, 4 mm. in diam.; style declinate, 4 cm. long.

Range.—R. S. Afr.: Transvaal, Ventersdorp.

Notes.—According to Barker (1933) *N. Falcata* appears to be most nearly related to *Nerine flexuosa* var. *sandersonii* (illustrated in Fl. Pl. S. Afr. pl. 129), both having a long slender angular scape, a centripetal umbel, non-appendiculate stamens, but the flowers of *N. falcata* "are more dainty in shape and more delicate in coloring" and this species also differs in having leathery falcate leaves, with scabrous margins, and obtuse apex; the falcate leaves most closely resemble those of *N. laticoma* (figured on Plate 124, Fl. Pl. S. Afr.,) but they are always raised well above the ground and not prostrate, as seems to be the rule in *N. laticoma.*

2c. Nerine laticoma subsp. krigei (Barker) Traub, subsp nov.

Syn.—*Nerine krigei* Barker, S. Afr. Gard. 22: 137. 1932; Fl. Pl. S. Afr. 15: pl. 567. 1935.

Bulb ovoid, 4 cm. in diam., continued into a neck, 2.5 cm. long, tunics papery, dark brown. *Leaves* 4—5, produced with the flowers (synanthous), erect, firm, spirally twisted, narrowing gradually to the obtuse apex, 27 cm. long. 1.2 cm. wide. *Scape* compressed and two-angled, spirally twisted, 36 cm. long, 5 mm. in diam. *Spathe-valves* 3.5 cm. long. *Umbel* 12-flowered, centripetal, up to 17 cm. in diam. *Pedicels* glabrous, up to 7.5 cm. long. *Tepalsegs* 3.7 cm. long, 5 mm. wide, rose-pink with a green keel, slightly undulate, apex recurved. *Stamen-filaments* declinate, non-appendiculate at the base, almost as long as the tepalsegs. *Ovary* acutely angled, angles compressed and scabrous with minute papillae, 3 mm. long, 5 mm. in diam.; style short at first, finally as long as the stamens. *Stigma* minutely 3-lobed.

Range.—R. S. Afr.: Transvaal, Standerton, flowering in February and March. Incorrectly indicated as from Rhodesia, near Victoria Falls, in the original description.

Notes.—According to Barker (1935) this species belongs to the group of northern species comprising *N. laticoma, N. falcata* and the plant that is at present known as *N. flexuosa* var. *sandersonii* Bak. In common with these three, *N. krigei* has leaves that appear with the flowers (synanthous), the scape is compressed and two-edged, the umbel is many-flowered; the waving of the tepalsegs is obscure, and the stigma is inconspicuous. However, it differs from them all in having narrower leaves and acutely-angled and scabrous ovary; and agreeing with *N. falcata* in the general shape and size of the flowers, and acuminate tepalsegs.

3. Nerine duparquetiana (Baill.) Bak., Fl. Cap. *6*(2); 214. 1896; Dyer, Fl. Pl. S. Afr. pl. 1118. 1951.

Syn.—*Imhofia duparquetiana* Baill., in Bull. Linn. Soc. Paris ii(1894)1132; Bak. Gard. Chron. ii(1894)624.

Bulb globose, about 6 cm. in diam., bulb-neck present. *Leaves* 4—6, contemporary with the flowers, lorate, 20—26—30 cm. long, 1.5 cm. wide, straight or slightly arcuate, spreading on the ground with age, glabrous, green. *Scape* arising with, but outside the same season's leaves, compressed, about 18 cm. long, 7—8 mm. at its greatest width, and 4 mm. at its least; minutely pubescent with delicate short hairs. *Spathe-valves* 3.5—4 cm. long, lanceolate, scarious. *Umbel* 15—20-flowered, centripetal. *Pedicels* 6—9—10 cm. long, about 2.5 mm. in diam., pubescent with delicate short hairs. *Ovary* about 6 mm. in diam., somewhat obscurely 3-angled, ovules 2 per cell. *Tepaltube* very short. *Tepalsegs* linear-lanceolate, acuminate, not undulated, white within, flushed shell-pink at the face, and with a green keel down the back (with multinerved carmine keel according to Baillon), up to about 8 cm. long and 6 mm. wide; at first 5 tepalsegs spread upwards and reflex, and the 6th subtends the stamens and style, but gradually this rotates from the base, clockwise or counter-clockwise and the others move slightly in the same direction so that they are more or less symmetrically arranged, 3 on either side of the vertical axis. *Filaments* declinate, shorter than the tepalsegs; 3 slightly longer than the others; inserted on the apex of the short tepaltube, without basal appendages but occasionally showing rudimentary shoulders. *Style* at first straight, curving above the dehisced anthers as it matures; stigma capitate, pubescent (pappilose).

Range.—R. S. Afr.: Cape Prov., Kalahari Region.

Section II. **NERINE**

Scape relatively long, slender; stamens-filaments thickened at the base but not otherwise modified at the base; perigone, stamens and style nearly erect. Nomenifer: *N. sarniensis* (L.)Herb.

4. NERINE SARNIENSIS (L.)Herb., Bot. Mag. sub pl. 2124. 1820; App. 19. 1821; Herb. Amaryll. 283. 1837; Gard. Chron. 779-810. 1885; Bak. Amaryll. 99. 188; Fl. Cap. 6(2): 209—210. 1896; Pole Evans, Fl. Pl. S. Afr. 9: pl. 355. 1929.

Syn.—*Amaryllis sarniensis* L., Sp. Pl. ed. 1. 293. 1753; Bot. Mag. 9: pl. 294. 1795; Red. Lil. pl. 33. 1802; Jacq. Hort. Schoenbr. 1: 34, pl. 66. 1797; *Amaryllis dubia* Houtt., Handeiding. . . . Pl. 11: 181. pl. 84, cum. ic. 1773-83; *Haemanthus sarniensis* (L.) Thunb. 58. 1794-1800; Fl. Cap. ed. Schult. 298. 1823; *Amaryllis jacquinii* Tratt., Gartenfl. 43. 1821; *Nerine cochinchinensis* M. Roem. Syn. Monogr. Amaryll. 4: 104. 1847; *Nerine jacquinii* (Tratt.) M. Roem. Syn. Monogr. Amaryll. 4: 105. 1847; *Nerine insignis* Leichtl. Gard. Chron. i(1886)41; *Nerine profusa* Bak., Amaryll. 1888; *Nerine sarniensis* var. *profusa* Bak. Amaryll. 100. 1888.

Bulb globose, 2.5—3 cm. in diam. *Leaves* about 6, appearing after the flowers, 15—30 cm. long, 1.2—1.9 cm. wide, strap-shaped, obtuse, glabrous, bright green, suberect. *Scape* 25—30—46 cm. long, compressed, smooth. *Spathe-valves* 2, crimson, ovate-lanceolate, 3.8—5 cm. long. *Umbel* 7—10—20-flowered, centripetal; perigone erect, 3.8 cm. long. *Pedicels* 1—3(—5) cm. long, of different lengths in the same umbel; terete, glabrous. *Ovary* globose, 2—3—4 mm. in diam. *Tepaltube* very short (3 mm. long?). *Tepalsegs* 3.5 cm. long, 6—13 mm. wide, at length reflexed, oblanceolate, crisped on the margin. *Stamens* erect; filaments scarlet, slightly (1.3 mm.) longer than the tepalsegs; anthers 3—4 mm. long, versatile. *Style* straight, nearly 5 mm. long.

Range.—R. S. Afr. Coast Region, Table Mountain.

Notes.—Known under the common name, "Guernsey Lily". Flowers in September and October in Northern Hemisphere.

4a. NERINE SARNIENSIS var. SARNIENSIS. Flowers bright crimson.

4b. NERINE SARNIENSIS var. PLANTII Bak. Amaryll. 100. 1888. Flower scapes taller than in the other varieties; flowers duller crimson, or rosy-crimson; scape longer; tepalsegs distinctly unguiculate. *Nerine plantii* O'Brien, Flora & Sylva 3: 122. 1805, nomen subnudum, apparently belongs here.

4c. NERINE SARNIENSIS var. VENUSTA (Ker-Gawl.) Bak., Amaryll. 100. 1888.

Syn.—*Amaryllis venusta* Ker-Gawl. Bot. Mag. pl. 1090. 1808; *Nerine venusta* (Ker-Gawl.) Herb. App. 19. 1821; Bot. Mag. 2124. 1820; Herb. Amaryll. 283. 1837; *Nerine venusta* var. *sarniensis* (L.) Herb. in Amaryll. 283. 1837; *Nerine venusta* var. *minor* Herb. Amaryll. 283. 1837; *Imhofia venusta* (Ker-Gawl.) Salisb. Gen. Pl. 118. 1866.

Flowers bright scarlet, produced in September; tepalsegs wavy, quite falcate.

4d. NERINE SARNIENSIS var. CORUSCA (Ker-Gawl.) Bak., Amaryll.

100. 1888; Fl. Cap. 6(2): 210. 1896.

Syn.—*Amaryllis corusca* Ker-Gawl., Bot. Mag. sub pl. 1430. 1811; *Amaryllis humilis* β Ker-Gawl., Bot. Mag. pl. 1089. 1808; *Nerine corusca* (Ker-Gawl.) Herb. Bot. Mag. sub pl. 2124. 1820; Herb. App. 1821; Amaryll. 283. 1837; *Imhofia corusca* (Ker-Gawl.) Salisb. Gen. Pl. 118. 1866.

Leaves broader than in the typical form, bright green, with distinct cross-bars between the main veins; flowers large, bright scarlet, resembling those of *N. sarniensis* var. *curvifolia.*

4e. NERINE SARNIENSIS var. ROSEA (Herb.) Bak., Amaryll. 100. 1888; Fl. Cap. 6(2): 210. 1896.

Syn.—NERINE ROSEA Herb. App. 19. 1821; Bot. Mag. pl. 2124. 1820; *Nerine venusta* var. *rosea*(Herb.)Herb. Amaryll. 283. 1837; *Imhofia rosea* (Herb.). Salisb. Gen. Pl. 118. 1866.

4f. NERINE SARNIENSIS var. ALBA Traub, *var. nov. floribus albis.*

Flowers pure white. Range.—Table Mountain.

4g. NERINE SARNIENSIS var. CURVIFOLIA (Jacq.)Traub, VAR. NOV.

Syn.—*Amaryllis curvifolia* Jacq., Hort. Schoenbr. 1: 33, pl. 64. 1797; Ker-Gawl., Bot. Mag. pl. 725. 1804; Red. Lil. pl. 274. 1809; *Nerine curvifolia* (Jacq.) Herb. App. 19, 1821; Bot. Mag. pl. 729; Amaryll. 283. 1837; Bak. Amaryll. 100. 1888; Fl. Cap. 6(2): 210. 1896. *Imhofia glauca,* Gen. Pl. 118. 1866.

Bulb ovoid, 3.8—5 cm. in diam., tunics pale brown. *Leaves* 6, developed after the flowers, lorate, obtuse, curved laterally, thicker in texture than in *N. sarniensis,* glaucous, closely veined, up to 30 cm. long, 1.3—1.9 cm. wide. *Scape* slender, glaucous, 30—47 cm. long. *Spathe-valves* about as long as the pedicels. *Umbel* 8—12-flowered, centripetal, perigone erect, bright scarlet, 3—3.8 cm. long. *Pedicels* 2.5—3.8 cm. long. *Ovary* globose, 4 mm. in diam. *Tepaltube* very short. *Tepalsegs* oblanceolate, 6.5 mm. wide, equally falcate, but little crisped. *Stamens* suberect, about as long as the perigone. *Style* suberect, finally 5 cm. long.

Range.—R. S. Afr.: habitat unknown.

Notes.—Common in gardens in Europe and the United States, where it flowers in the middle to the end of September. This species is retained tentatively until a more critical study can be made.

4g.-a. NERINE SARNIENSIS var. CURVIFOLIA f. CURVIFOLIA. Plant less robust.

4g.-b. NERINE SARNIENSIS var. CURVIFOLIA f. FOTHERGILLII(Andr.) Traub, f. nov.

Syn.—*Amaryllis fothergillii* Andr. Bot. Reposit. 163. 1816; *Nerine fothergillii* (Andr.) Roem. Monogr. Amaryll. 104. 1847; *Nerine curvifolia* var. *fothergillii* (Andr.)Bak. Fl. Cap. 6: 210. 1896; *Nerine fothergillii* var. *major* Fitzherbert, Gard. Chron. ii(1904)332.

Plant more robust in all its parts; leaves broader; flowers in the umbel numerous, colored between crimson and scarlet.

4h. NERINE SARNIENSIS var. MOOREI (Leicht.) Traub, VAR. NOV.

Syn.—*Nerine moorei* Leichtl. in Gard. Chron. ii(1886)681; Bak., Amaryll. 100. 1888; Fl. Cap. 6(2): 210-211. 1896.

Bulb globose. *Leaves* produced a little after the flowers, 22—30 cm. long, 1.3—1.9 cm. wide, much curved, slightly twisted, bluntly acute, bright green. *Scape* stout, compressed, shorter than the leaves. *Spathe-valves* lanceolate, longer than the pedicels. *Umbel* 6—9-flowered, centripetal; perigone bright scarlet, erect. Pedicels 2—2.5 cm. long; *Ovary* 3.5 mm. in diam. Tepelsegs oblanceolate, crisped, 3 cm. long, nearly 6.5 mm. wide. *Stamens*: filaments erect, longer than the tepalsegs; anthers oblong. *Style* straight, 3.8 cm. long.

Range.—R. S. Afr.: Habitat unknown. Described from a plant sent to Leichtlin by F. W. Moore, of the Glasnevin Gardens. This may be a hybrid between *N. curvifolia* and *flexuosa,* and is retained here *tentatively* until a more critical study can be made.

Section III. **BOWDENIAE** Traub

Scape relatively longer, slender; stamen-filaments thickened at the base, but not otherwise modified at the base; perigone, stamens and style declinate. Nomenifer: *Nerine bowdenii* W. Watson.

5. Nerine schlecteri Baker, in Bull. Herb. Boiss. 2nd ser. 3: 665. 1903; Plant Life: 9: 76. 1953.

Bulb and leaves unknown, but the latter apparently appearing after the flowers. *Scape* slender, 30 cm. or more long. *Spathe-valves* 2, lanceolate, scarious, 1.2—1.8 cm. long. *Umbel* 3—5-flowered; perigone white, 1.2—1.4 cm. long. *Pedicels* 6—8 mm. long, densely pubescent. *Ovary* depresso-globose, 4 mm. in diam., densely pubescent. *Tepaltube* very short. *Tepalsegs* flat, equal, lanceolate, (1—1.2 cm. long), 4 mm. wide. *Stamens* declinate, equaling the tepalsegs; filaments filiform, without appendages; anthers small, oblong, brown.

Range.—R. S. Afr.: Natal; among rocks on Mt. West, alt. 1800 m.

Notes.—Living material of this species is needed for further study.

6. Nerine breachiae Barker, in Fl. Pl. S. Afr. 15: pl. 566. 1935.

Bulb small, oblong-globose, 1.5 cm. in diam., continued into a short neck. *Leaves* 2—4, appearing after the flowers (hysteranthous), adpressed to the ground, lanceolate, subobtuse, dark green, 5 cm. long, 8 mm. wide. *Scape* terete, glabrous, 26 cm. long, 2.5 mm. in diam. *Spathe-valves* membranous, reddish-purple, 2—3 cm. long. *Umbel* usually 1—5-flowered, rarely up to 8-flowered. *Pedicels* glabrous, 2.5—4.5 cm. long. *Ovary* obtusely angled, 2.5 mm. in diam. *Tepalsegs* rose-pink, linear, apex recurved and undulate, 3.4 cm. long, 4—5 mm. wide. *Stamen-filaments* non-appendiculate at the base, shorter than the perigone, 2.5 cm. long. *Style* conspicuously longer than the stamens throughout the flowering period; stigma when mature distinctly 3-lobed.

Range.—R. S. Afr.: Cape Province, Bredasdorp Division, Bredasdorp.

Notes.—According to Barker(1935), *N. breachiae* flowers in late autumn; the leaves beginning to show as the flowers wither, and when mature are pressed to the surface of the ground, which distinguishes it from all others in this section, and which is shared only by the otherwise different *N. marginata.* It is among the lowliest of the genus; its nearest ally being *N. humilis,* but this has longer, glaucous, and almost erect leaves.

7. Nerine rydleyi E. P. Phillips, in Ann. S. Afr. Mus. 9: 128. 1913.

Bulb globose, 3—4 cm. long, 3—4 cm. in diam., continued into a neck about 4 cm. long; tunics membranous, brown. *Leaves* 4—5, contemporary with the flowers, 7—9 cm. long, 1.3—2 cm. wide in the widest part, lanceolate, obtuse, narrowed at the base, pustulate above, glabrous, dark green above, lighter on under side. *Scape* about 23 cm. long, 3 mm. in diam., terete, glabrous, purplish below, becoming green above. *Spathe-valves* linear-oblong, acuminate, acute, pink, 3 cm. long. *Umbel* 5-flowered, flowers declined. *Pedicels* 3—4 cm. long, 1.5 mm. in diam., subtrigonous. *Ovary* 3 mm. long, globose, brown. *Tepalsegs* about 3 cm. long, 5 mm. wide, the two anterior ones much wider apart than the others, linear, subobtuse, recurved, crisped, with a small glandular papilla at the apex, pale pink, with a prominent midrib beneath (keel) of usually slightly deeper pink, and a distinct red streak on the lower half of the inner face of the tepalsegs. *Stamens* unequal in length, about horizontal, recurved upwards at the ends; 3 shorter filaments 2 cm. long; 3 longer 2.5 cm. long; all terete, pale pink, anthers 6 mm. long, oblong, purplish. *Style* horizontal, recurved above, 3.3 cm. long, terete, pale pink, stigma when mature trifid and papillose at the apex.

Range.—R. S. Afr.: locality unknown. Described from cultivated plant in the Municipal Gardens, Cape Town, May 1913.

Notes.—Considered as near *N. flexuosa,* but differing in the much shorter and comparatively broader leaves, and in the fewer-flowered umbel. Named in honor of G. H. Ridley, Curator at the Municipal Gardens, Cape Town.

8. Nerine bowdeni W. Watson, Gard. Chron. 1904, vol. 36, p. 365; Bot. Mag. pl. 8117. 1907; Dyer, Fl. Pl. S. Afr. 22: pl. 841. 1942.

Syn.—*Nerine veitchii* Gard. Chron. ii(1911)244, nomen subnudum.

Bulb 5 cm. in diam, 6 cm. long, continued into a bulb neck 6 cm. long. *Leaves* produced after the flowers, up to 8—20—30 cm. long, 1.5—3 cm. wide. *Scape* erect, up to 45 cm. long, nearly cylindric, 5—6 mm. in diam., solid at the base, becoming hollow towards the apex. *Spathe-valves* 2, membranous, lanceolate, unequal in length, up to 5 cm. long. *Umbel* 6—7-flowered (sometimes up to 12-flowered in cultivation), 15—20 cm. across. *Pedicels* trigonous, up to about 5 cm. long, the central ones shorter. *Tepaltube* very short. *Tepalsegs* rose-pink, the midrib darker; up to 6 (—6.4—7.6) cm. long, 7—8 mm. wide, undulate along the margins, above the middle on the recurved portions. *Stamens* without appendages, somewhat shorter than the tepalsegs; upcurved at the tips. *Style* about as long as the stamens, very shortly 3-lobed, the lobes adhering together (obscurely 3-lobed). *Capsule* obtusely and irregularly 3-lobed, up to 1 cm. in diam.

Range.—R. S. Afr.: Cape Province.

Notes.—Named for Mr. Athelstan Cronish-Bowden, who sent the bulbs from Cape Province to his mother in England. Gumbleton decribed it as *N. excellens tardiflora*(Gard. Chron. Feb. 13, 1904, p. 105), and Veitch exhibited it as *N. excellens* major *tardiflora* (Gard. Chron. Oct. 22, 1904, p. 292).

9. NERINE FLEXUOSA (Jacq.)Herb. App. 19. 1821; Amaryll. 283. 1837; Kunth, Enum. Pl. 5: 619. 1850; Bak., Amaryll. 100. 1888; Fl. Cap. 6(2): 211. 1896; Barker, Fl. Pl. S. Afr. 15: pl. 561. 1935.

Syn.—*Amaryllis flexuosa* Jacq., Hort. Schoenbr. 1: 35, pl. 67. 1797; Ker-Gawl. Bot. Reg. pl. 172.

Bulb subglobose, 2.5—3.8 cm. in diam., continued into a neck; tunics light brown. *Leaves* 4—6, contemporary with the flowers, linear-lorate, arcuate, bright green, smooth, thin, up to 60 cm. long, 1.5—2 cm. wide. *Scape* slender, subterete, glabrous, flexuose, up to 60 cm. long, 4 mm. in diam. *Spathe-valves* lanceolate, tinged with reddish-purple, 3.8 cm. long. *Umbel* 6—10—20-flowered, centripetal; perigone generally pale pink. *Pedicels* 2.5—3.8—5—7.5 cm. long, slender. *Ovary* globose-trigonous, 4 mm. in diam. *Tepaltube* very short. *Tepalsegs* crisped, oblanceolate, 2.5—3 cm. long, 4 mm. wide. *Stamens* declinate, the 3 longer ones shorter than the tepalsegs, anthers oblong, claret red, 3—4 mm. long. *Style* pale pink, declinate, as long as the stamens.

Range.—R. S. Afr.: Cape Province Central Region; Kalahari Region.

9a. NERINE FLEXUOSA var. FLEXUOSA. The typical form.

9b. NERINE FLEXUOSA var. ALBA Gumbleton, Gard. Chron. ii(1904) 334. Flowers white.

9c. NERINE FLEXUOSA var. PULCHELLA(Herb.)Bak., Amaryll. 101. 1888; Fl. Cap. 6(2): 211. 1896. Syn—*Nerine pulchella* Herb. App. 19. 1821; Bot. Mag. pl. 2407.

Leaves glaucous, firmer in texture than in the type. *Scape* not flexuose. *Tepalsegs,* pink with a rose-red keel. Stamens and style nearly white.

10. NERINE ANGUSTIFOLIA (Bak.)W. Watson, in Gard. Chron. ser. 3. 6, 1889; Bak. Fl. Cap. 6: 209, 211. 1896; Pole Evans, in Fl. Pl. S. Afr. 17: pl. 658. 1937; R. H. S., Dict. Gard. 3: 1367. 1951; Sealy, Bot. Mag. 70: pl. 244. 1955.

Syn.—*Nerine pulchella* var. *angustifolia* Bak., Saund. Ref. Bot. 5: pl. 329. 1872; *Nerine flexuosa* var. *angustifolia* (Bak.)Bak., in Gard. Chron. n. ser. 24, 779, 1885; et Amaryll. 101. 1888; *Nerine angulata* L. Bolus, in S. Afr. Gard. 20: 148. fig. B. 1930.

THE ELEGANT NERINE. *Bulb* ovate, 2.5 (—3.8) cm. long, 1.7 cm. in diam.; tunics gray-brown. *Leaves* 6, contemporary with the flowers, linear, slightly narrowed in the upper part to the blunt apex, about 33 cm. long, 3—5 mm. wide, bright green, suberect. *Scape* terete, 40—70 cm. long above the ground, bright green, sparsely spreading puberulous, more densely so at the apex. *Spathe-valves* lanceolate, 2.5 cm. long, white, membranous and ribbed at anthesis; bracteoles filiform, 1—1.7 cm. long, white. *Umbel* 6—12-flowered. *Pedicels* 1.3—5(—7) cm. long, densely covered with short spreading somewhat glandular rather thick papilla-like hairs which become brownish in dried specimens. *Ovary* subglobose, 3-locular, about 5 mm. in diam., densely covered with short spreading hairs like those of the pedicels. *Tepaltube* about 2—3 mm. long. *Tepalsegs* linear-oblong, obtuse, 3—3.3—4—4.3 cm. long, 5 mm. wide; the anterior tepalseg extended horizontally and the other five tepalsegs spreading-ascending, and somewhat recurved, magenta-colored, deeper along the middle of the tepalsegs, 3-nerved in the middle, margins somewhat undulate. *Stamens* adnate to the inside of the tepaltube for about 2—3 mm.; filaments declinate, upcurved toward the apex, free part 2—2.5 cm. long, filiform from a broad base, magenta-colored; anthers dull purplish, 5—5.5 mm. long at first, blackish; about 2.5 mm. long when dehisced; pollen pale creamy yellow. *Style* about 2 cm. long, straight or decurved at first, magenta-colored; stigma 3-lobed, white papillose.

Range.—Southern Africa: R. S. Afr.: n. Cape Province, Orange Free State, n. Natal, and Transvaal. Botswana and Swaziland.

Notes.—According to Sealy (1955), *N. angulata* L. Bolus is conspecific with *N. angustifolia.* He further believes that *N. angustifolia* should be combined with *N. filifolia* as a variety, but the writer does not share this opinion. He states that *N. filamentosa* W. N. Barker can scarcely rank as more than a variety of *N. filifolia,* but again, the writer does not share this opinion.

11. NERINE ALATA Barker, in Fl. Pl. S. Afr. 15: pl. 563. 1935.

Bulb globose, up to 4 cm. in diam. *Leaves* appearing after the flowers (hysteranthous), linear, obtuse, green, 10 cm. or more long, 9 mm. wide. *Scape* terete, bright green, glabrous, very tall, 60—90 cm. long, 5 mm. in diam. *Umbel* 14—18-flowered, centrifugal, 7—9 cm. in diam. *Spathe-valves* acute, dark reddish-purple, 2.5 cm. long or a little longer, 5 mm. wide. *Pedicels* green, tinged with brown, up to 2.5 cm. long. *Tepalsegs* mauve-link, margins much crisped throughout their whole length, 2.1 cm. long, 2.5 mm. wide, conduplicate in the lower half, widening and flattening, thus forming as it were a cup above the ovary, 5 mm. long, 5 mm. in diam. *Stamens* declinate, finally 1.6 cm. long; anthers dark red before dehiscing, 4 mm. long. *Ovary* obtusely-angled, 2.5 mm. in diam.; style slender, finally as long as the stamens; stigma minute, 3-lobed.

Range.—R. S. Afr.: Cape Province, King William Division, Hogsbeck.

Notes.—*Nerine alata* is closely allied to *N. undulata* but differs from it mainly in the hysteranthous leaves, the very long scape, tepalsegs "distinctly longer than the stamens, and conspicuously widened at the base, with the dilated parts either contiguous or slightly overlapping, so that a sort of cup is formed above the ovary." The type locality (Hogsbeck) has produced no other *Nerine*, and it is unlikely that its range would overlap with that of *N. undulata.*

This species was first collected by Frances Leighton, March 1932.

12. NERINE UNDULATA (L.) Herb. App. 19. 1821; Amaryll. 283, Pl. 45, fig. 2. 1837; Bak., Amaryll. 102. 1888; Fl. Cap. 6(2): 212—213. 1896.

Syn.—*Amaryllis undulata* L., in Syst. Nat. ed. 12; Mill. Hort. Kew, 352, cum ic.; L'Herit. Sert. Angl. 16; Bot. Mag. pl. 369. 1797; Red. Lil.

115. 1805; Jacq. Hort. Bot. Vind. etc. 3: pl. 13. 1776; Tratt. Arch. pl. 393. 1814; *Haemanthus undulatus* (L.)Thunb., Fl. Cap. ed. Schult. 297. 1823; *Nerine crispa* Bak., Amaryll. 102. 1888; Vilmorin in Blumeng. ed. 3. Sieb & Voss. 1: 1008. 1895.

Bulb ovoid, 2—2.5 cm. in diam., tunics pale, membranous. *Leaves* 4—6, linear, contemporary with the flowers, bright green, 6.4—1.3 mm. wide. *Scape* slender, 30—46 cm. long, 6—13 mm. wide. *Spathe-valves* lanceolate, as long as the pedicels. *Umbel* 8—12-flowered, centrifugal; perigone pale pink (rose). *Pedicels* slender, 2.5—3.8 cm. long. *Ovary* globose-trigonous, 3—4 mm. in diam. *Tepaltube* very short. *Tepalsegs* spreading widely from the base, oblanceolate, much crisped, 1.7—2 cm. long, 2 mm. wide. *Stamens* declinate, about as long as the tepalsegs. *Style* declinate, as long as the petalsegs. *Capsule* deeply lobed, 6 mm. in diam.; 1 seed per locule.

Range.—R. S. Afr.: Coast Region below Table Mountain; Wynberg to Port Elizabeth; Kalahari Region; and Orange Free State; and lower Damaraland.

12a. NERINE UNDULATA var. UNDULATA. The typical form. Tepalsegs much crisped.

12b. NERINE UNDULATA var. MAJOR (Tratt.)Bak. Amaryll. 102. 1888; Fl. Cap. 6(2): 213. 1896. Syn.—*Amaryllis major* Tratt. Arch. pl. 394; *Amaryllis aucta* Tratt. Thes. Bot 9, pl. 45. 1819; *Nerine aucta* (Tratt.) M. Roem. Syn. Monogor. Amaryll. 4: 107. 1847.

Perigone larger and less crisped. Appears to be nothing more than a form.

13. NERINE HUMILIS (Jacq.) Herb. Bot. Mag. sub pl. 2124. 1820; App. 19. 1821; Amaryll. 283. 1837; Kunth, Enum. Pl. 5: 621. 1850; Leichtl. Bull. Soc. Tosc. Ortic. 15: pl. 5, fig. 2. 1890; Bak. Amaryll. 102. 1888; Fl. Cap. 6(2): 213. 1896;

Syn.—*Amaryllis humilis* Jacq. Hort. Schoenbr. 1: 36, pl. 69, 1797; Red. Lil. pl. 450. 1816; Bot. Mag. pl. 726. 1804.

Bulb ovoid, 2.5—3.8 cm. in diam., tunics membranous. *Leaves* about 6, contemporary with the flowers in November (Northern Hemisphere), linear, bright green, suberect, channeled down the face, about 20 cm. long, about 1.3 cm. wide. *Scape* slender, subterete, slightly glaucous, 15—46 cm. long. *Spathe-valves* lanceolate, green, about as long as the pedicels. *Umbel* 10—20-flowered, centrifugal; perigone bright pink or rose-red, 2.5—3 cm. long. *Pedicels* slender, 2.5—3.8 cm. long. *Ovary* globose-trigonous, 3—4 mm. in diam. *Tepaltube* very short. *Tepalsegs* oblanceolate, acute, crisped, 2.5—3 cm. long. *Stamens* declinate, the 3 longer about equaling the tepalsegs; anthers oblong, purple, 3 mm. long. *Style* declinate, as long as the tepalsegs.

Range.—R. S. Afr.: Cape Province, Coast Region, Table Mountain; Albany Division.

Notes.—Differs from *N. flexuosa* by the centrifugal umbel, its dwarfer habit, and narrower, channeled leaves.

13a. NERINE HUMILIS subsp. HUMILIS. Leaves bright green, umbel 10—20-flowered.

13b. NERINE HUMILIS subsp. FERA (Barker)Traub, *comb. nov.*

Syn.—*Nerine humilis* forma *fera* Barker, in Fl. Pl. S. Afr. 15: pl. 564. 1935.

Bulb oblong, 4.5 cm. long, 2.5 cm. in diam.; continued into a neck 3.5 cm. long, tunics grayish. *Leaves* 3—5, appearing after the flowers (hysteranthous), suberect or spreading, linear, obtuse, glaucous green, 16 cm. long, 8 mm. wide. *Scape* terete, glabrous, bright green, up to 31 cm. long, 3 mm. wide. *Spathe-valves* lanceolate, acute, purplish-red, up to 4 cm. long. *Umbel* centrifugal, 6—7-flowered. *Pedicels* glabrous, up to 4.3 cm. long. *Ovary* obtusely-angled, 3 mm. in diam. *Tepalsegs* pink with a red central stripe, only slightly undulate, recurved near the apex, 3.1 cm. long, 4 mm. wide. *Stamens* declinate, nearly as long as the perigone. *Style* declinate, longer than the stamens; stigma minutely 3-lobed.

Range.—R. S. Afr.: Cape Province; Collected by Prof. T. Baron and Paymaster Captain Salter in April 1932.

Notes.—*Nerine humilis* subsp. *fera* differs from the typical form mainly in the glaucous, hysteranthous leaves, fewer-flowered umbel.

14. NERINE PEERSII Barker, Fl. Pl. S. Afr. 15: pl. 562. 1935.

Bulb depresso-globose, 2.5 cm. long, 3 cm. in diam., continued into a neck above, up to 7 cm. long. *Leaves* 5, appearing with the flowers, linear, obtuse, minutely scabrous on the upper surface, scarcely glaucous, up to 25 cm. long, 7—12 mm. wide. *Scape* terete, bright green, reddening at the base, 32 cm. long, up to 3 mm. in diam. *Spathe-valves* lanceolate, dark reddish-purple, 4.5 cm. long. *Umbel* 5—6-flowered, centrifugal, 15 cm. in diam. *Pedicels* quite glabrous, 4—6 cm. long. *Ovary* obtusely angled, 3 mm. in diam., several ovules in each locule. *Tepalsegs* finally all forming the posticus lip (the stamens and style forming the anticus lip), linear, acuminate, undulate in the upper half, the apex recurved and spirally twisted; the margins in the lower half incurved, and minutely crisped, the base flat and deep carmine, paler above, with a narrow strip near the base on the upper side, 4—5 cm. long, up to 4 mm. wide. *Stamens* as long as the tepalsegs; anthers dark red before dehiscing, 6 mm. long. *Style* throughout the flowering period longer than the stamens; stigma conspicuously 3-lobed when mature.

Range.—R. S. Afr.: Cape Province, Uniondale Division.

Notes.—*Nerine peersii* resembles *N. flexuosa* var. *pulchella* (see Bot. Mag. pl. 2407), but differs in having long-acuminate, narrower tepalsegs, which are more markedly waved at the margins, a more slender scape, somewhat flexuous pedicels; leaves scarely glaucous, and more numerous, and in other particulars.

The species was named for V. S. Peers.

15. NERINE PUDICA Hook. f. Bot. Mag. pl. 5901. 1871; Bak. Amaryll. 101. 1888; Fl. Cap. 6(2): 212. 1896; Fl. des Serres, pl. 2464. 1880; Leichtl. Bull. Soc. Tosc. Ortic. 15: pl. 5, fig. 3. 1890.

Bulb globose, about 2.5 cm. in diam. *Leaves* 4—6, contemporary with the flowers, linear, glaucous, suberect, persistent, 20—23 cm. long, 6—8.5 mm. wide. *Scape* slender, subterete, 30—46 cm. long. *Spathe-valves* lanceolate, 2.5—3.8 cm. long. *Umbel* 4—6-flowered, centripetal; perigone erect or deflexed, 3—3.8 cm. long. *Pedicels* slender, 2.5—3.8 cm. long.

Ovary globose, 4 mm. in diam. *Tepaltube* very short (5 mm. long?). *Tepalsegs* oblanceolate, thin, plane, scarcely at all crisped, white with a pink keel, 2.5—3.2 cm. long. *Stamens* declinate, the 3 longer a little shorter than the tepalsegs; anthers oblong, 3 mm. long. *Style* declinate, as long as the tepalsegs. Seeds globose.

Range.—R. S. Afr.: locality unknown. First described from a plant that flowered at Kew in 1868.

Notes.—Flowers in September (northern hemisphere).

15a. NERINE PUDICA var. PUDICA. Tepals white with a pink keel.

15b. NERINE PUDICA var. ELWESII Leichtl. ex. Bak., Amaryll. 101. 1888; Fl. Cap. 6(2): 212. 1896. Syn.—*Nerine elwesii* Leichtl., Gard. Chron. i(1886)42, nom. nud.

Leaves much broader, bright green, more persistent, distinctly veined, with a prominent mid-rib; umbel more compact, pedicels shorter, tepalsegs pale rose with a darker keel, thicker and more wavy.

15c. NERINE PUDICA var. ALBA Worsley, Gard. Chron. ii(1911)325. Flowers pure white.

16. NERINE BRACHYSTEMON Bak., Fl. Cap. 6(2): 212. 1896.

Bulb unknown. *Leaves* about 5, subterete, glabrous, 30 cm. long, 1.5 mm. in diam. *Scape* slender, 46 cm. long. *Spathe-valves* 3.8—5 cm. long. *Umbel* 10—20-flowered, centripetal; perigone bright red. *Pedicels* stiffly erect, pubescent, 3.8—5 cm. long. *Ovary* globose, deeply lobed, 4.2 mm. in diam. *Tepaltube* very short. *Tepalsegs* linear, rather crisped, 2—2.2 cm. long. *Stamens* not more than half as long as the tepalsegs; anthers small, oblong.

Range.—R. S. Afr.: Cape Province, Eastern Region, Griqualand East, near Kokstad, alt. 1,524 m.

Notes.—Living material for study is needed.

17. NERINE FILAMENTOSA Barker, in Fl. Pl. S. Afr. 15: pl. 569. 1935.

Bulb 3 cm. in diam., continuous with a short neck, tunics blackish-brown. *Leaves* 3—4, produced with the flowers, straight or slightly flexuous and spirally twisted, semiterete, slightly channeled above, glabrous, up to 34 cm. long, 2 mm. in diam. *Scape* terete, pubescent with short pluricelled hairs, up to 30 cm. long, 3 mm. in diam. *Spathe-valves* lanceolate, acute, suffused with purple, nearly as long as the pedicels. Umbel 6—9-flowered, flowers bright rose, centripetal, up to 18 cm. in diam. *Pedicels* with minute pluricelled hairs, the young ones reddish, the older ones suffused with green, up to 7 cm. long, 1.25 mm. in diam. *Tepalsegs* linear, acute, circinately revolute above, the margin in the upper half undulate, in the lower half flat, up to 5.5 cm. long, 3 mm. wide. *Stamens* scarcely declinate, finally up to 5.7 cm. long. *Ovary* acutely angled, with a few pluricelled hairs, dark purplish-brown, 3 mm. in diam. *Style* lengthening remarkably, finally as long as the stamens.

Range.—R. S. Afr.: Cape Province; Albany Division; Grahamstown.

Notes.—Barker notes that the tepalsegs "for half of their length are curled back in a circinate manner, leaving the long, almost straight and scarcely declinate, slender filaments protruding as conspicuously from the flower as they do in the otherwise very different section which contains *N. sarniensis.* It is this last character as well as the slender form of the filaments which suggested the name.''

This species shows affinities with *Nerine filifolia.*

18. Nerine pusilla Dinter, in Neue Pfl. Deutsch-Suedwest-Afr. p. 48. 1914.

Bulb 3 cm. long, about 1.8 cm. in diam., tunics white. *Leaves* subterete, grass-green, 15—20 cm. long, 8 mm. in diam. *Scape* lateral, 7—9 cm. long, 2 mm. in diam. *Spathe-valves* 2, lanceolate, 2 cm. long. *Pedicels* 2.5 cm. long, minutely hirsuate. Umbel 3—5-flowered; perigone white, rose-colored in lower part, tepalsegs keeled brownish-greenish in upper part. *Tepalsegs* 1.7 cm. long, 3—4 mm. wide, apex bearded on inner side. *Stamens*: 3 inner 1.6 cm. long, 3 outer 1.3 cm. long; filaments declinate-ascending; anthers rose-brown. *Style* declinate-ascending, stigma prominently 3-lobed.

Range.—R. S. Afr.: Damaraland, Gobabis and Steinhausen.

Notes.—Dinter collected this plant in 1912, and cultivated it at Okahandia in Damaraland. He remarks on the great beauty of the species.

19. Nerine tulbaghensis Barker, in Fl. Pl. S. Afr. 15: pl. 565. 1935.

Bulb small, globose, 1.5 cm. long, 1.2 cm. in diam. continued into a short neck. *Leaves* 4—5, present with the flowers (synanthous) subpatent, linear, slightly channeled above, obtuse, dark green, reddening at the base, 6—9 cm. long, 2 mm. wide. *Scape* reddening at the base, 10—12 cm. long, 2 mm. in diam. *Spathe-valves* oblong lanceolate, acuminate, reddish-purple, 1.5—2 cm. long. *Umbel* 2—3-flowered. *Pedicels* glabrous, 1—2.5 cm. long. *Ovary* obtusely angled, 2 mm. in diam. *Tepalsegs* pale pink, recurved and margins undulate towards the apex, 2.2 cm. long, 3 mm. wide. Stamens declinate, finally turned up at the apex, filaments non-appendiculate, as long as the tepalsegs. *Style* declinate, longer than the stamens.

Range.—R. S. Afr.: Cape Province, Tulbach Kloof.

Notes.—According to Barker, *N. tulbaghensis* was formerly included under *Nerine humilis* Jacq., but the leaves are synanthous, and they are very narrow. The whole plant is smaller, including the individual flowers; the differences are sufficient to warrant its being raised to specific rank.

20. Nerine rehmannii (Bak.)L. Bolus ex Traub, comb. nov.; S. Afr. Gard. 20: 148. 1930, without literature citation.

Syn.—*Hessea rehmannii* Bak., Amaryll. 22. 1888; Barker, Fl. Pl. S. Afr. 3: pl. 120. 1923.

Bulb globose, 1.8 cm. long, 1.5 cm. in diam. continuing into a neck, 1—1.5 cm. long; tunics papery. *Leaves* usually 1, synanthous rarely 2, filiform, 9 cm. long, quite terete or with a shallow channel, glabrous. *Scape* 15 cm. long, terete, glabrous. *Umbel* about 9-flowered, centripetal. *Spathe-valves* 2 mm. long, ovate, acute. *Pedicels* 8 mm. long, terete, glabrous. *Ovary* 2.5 mm. in diam., globose, glabrous, with a single ovule in each cell. *Tepalsegs* 8 mm. long, 1.5 mm. wide, linear, much crisped, with 3 tepalsegs minutely and bluntly apiculate, and with papillae at the apex. *Stamens*: filaments attached to the base of the tepalsegs, 5 mm. long, terete; anthers 1 mm. long, orbicular, basifixed. *Style* 7 mm. long, terete; stigma 3-lobed, papillose.

Range.—R. S. Afr.: Transvaal.

Notes.—This is a very distinct species.

21. Nerine filifolia Bak., Bot. Mag. pl. 6547. 1881; Amaryll. 101—102. 1888; Fl. Cap. 6(2): 211. 1896.

Bulb globose, under 2.5 cm. in diam., continued into a short neck, tunics pale. *Leaves* 6—10, contemporary with the flowers, grass-green, very slender, suberect, 15—20 cm. long. *Scape* slender, terete, green, finely glandular-pubescent, up to 30 cm. long. *Spathe-valves* lanceolate, green, under 2.5 cm. long. *Umbel* 8—10—12-flowered, centripetal; perigone deflexed, rose pink. *Pedicels* slender, 2.5—3.8 cm. long. *Ovary* angled, minutely puberulous, brownish-green, 4 mm. in diam. *Tepaltube* 2 mm. long. *Tepalsegs* linear, oblanceolate, unguiculate, 2.5—3 cm. long, 3—4 mm. wide, spreading from the center, margins crisped. *Stamens* declinate, shorter than the tepalsegs; anthers oblong, red. *Style* equaling the longer stamens.

Range.—Orange Free State, Kalahari Region.

Notes.—Plants similar to that figured in Bot. Mag. 6547 have not been collected from Orange Free State since it was taken there by Ayres in 1879. A similar plant, *N. parviflora* (description follows) with a totally different flowering season is known to exist in Cape Province, near Grahamstown.

22. Nerine parviflora (Barker) Traub, comb. nov.

Syn.—*Nerine filifolia* var. *parviflora* Barker, Fl. Pl. Sl. Afr. 15: pl. 568. 1935; Plant Life 9: 163. 1953.

Bulb oblong-globose, about 2 cm. long, 1.2 cm. in diam. continued into a neck about 1.5 cm. long. *Leaves* 2—3, appearing with the flowers (synanthous), filiform, up to 18 cm. long. *Scape* bright green, minutely glandular-pubescent with pluricelled hairs, 23 cm. long. 2.5 mm. in diam. *Spathe-valves* lanceolate, acute, purplish or yellowish, 2 cm. long. *Umbel* 3—8-flowered, centripetal. *Pedicels* minutely glandular-pubescent with pluricelled hairs, tinged with red-brown, up to 2.5 cm. long, 2 mm. in diam. *Tepalsegs* 2.2. cm. long, 4 mm. wide, bright mauve-pink with a deeper central stripe most pronounced near the base, recurved and undulate in the upper half. *Stamens* declinate, non-appendiculate at the base, shorter than the tepalsegs, up to 2 cm. long; anthers dark reddish-purple before dehiscing, 2.5 mm. long. *Ovary* sub-acutely angled, minutely glandular-pubescent, dark reddish-brown; style at first short, and straight, lengthening and recurving in the older flowers, 1.4 cm. long; stigma capitate.

Range.—R. S. Afr.: Cape Province, near Grahamstown.

Notes.—According to Barker (1935), the main characteristics of *N. filifolia* are its few filiform or thread-like leaves that are contemporary with the flowers, the glandular pubescence on the scape, the pedicels and the ovary; the deep color of the zygomorphic perigone, where tepalsegs diverge very gradually from the center of the flower, and the declinate stamens shorter than the tepalsegs, and the *absence* of appendages at their bases. All of these characters are exemplified in *N. parviflora,* which differs in having smaller flowers, and a much later flowering season, namely in August (Southern Hemisphere), while that of *N. filifolia* extends from January to June(Southern Hemisphere). Thus *N. parviflora* is reproductively isolated from *N. filigolia,* and is apparently evolving along unique lines, and merits specific rank.

Section IV. **APPENDICULATAE** Traub

Stamen-filaments alternating with scales at the base; or appendiculate at the base, or appendages forming a staminal cup at the base. Nomenifer: *N. appendiculata* Bak.

23. NERINE FRITHII L. Bolus, in Ann. Bolus Herb. 3: 79. 1921; Fl. Pl. S. Afr. 18: pl. 691. 1938.

Bulb ovoid-globose, 2 cm. long, 1.7 cm. in diam. *Leaves* often only 2, contemporaneous with the flowers, subfiliform, channeled above, up to 15 cm. long, 1—1.5 mm. wide. *Scape* terete, up to 20 cm. long. *Spathe-valves* long-oblong, long-attenuate, 2.5—3 cm. long; bracteoles 1—1.5 cm. long, thread-like, membranous. *Umbel* 5—7-flowered; perigone pinkish. *Pedicels* pink in the upper ¾, green below. *Ovary* obovate, with 2 ovules per locule. *Tepaltube* very short. *Tepalsegs* spreading, at length recurved, linear, acute, with undulate margins, 1.5 cm. long, 4 mm. wide. *Stamens* declinate, filaments 3.5—6 mm. long, appendiculate at the base, forming a cup 3 cm. long, somewhat lacerated above, with two lobes usually much exceeding the others.; anthers 4 mm. long. *Capsule* globose, 8 mm. in diam.

Range.—R. S. Afr. Cape Province, Kalahari Region, Griqualand West, Kimberley Division, Riverton; Orange Free State, Hoopstadt.

Notes.—According to Bolus(1938), this species is allied to *N. appendiculata* Bak., but may be distinguished by the almost filiform leaves, glabrous pedicels, and fewer-flowered umbel and smaller flowers.

24. NERINE TRANSVAALENSIS L. Bolus, in F. Pl. S. Afr. 18: sub pl. 683, in obs.; sub pl. 681. 1928, in obs.; et in adnot. 1938.

Syn.—"Nerine frithii L. Bolus", Fl. Pl. S. Afr. 4: pl. 132. 1924, misidentified, non L. Bolus (1921); Plant Life 9: 164. 1953.

Bulb ovoid-globose, 2 cm. long, 1.7 cm. in diam. *Leaves* present with the flowers (synanthous), very often only 2, up to 15 cm. long, 1—1.5 mm. wide, subfiliform, channeled above. *Scape* up to 20 cm. long, terete. *Spathe-valves* oblong, long-attenuate, 2.5—3 cm. long; bracteoles thread-like, 1—1.5 cm. long. *Umbel* 5—7-flowered. *Pedicels* up to 3 cm. long. *Ovary* obovate; 2 ovules per locule. *Tepalsegs* spreading, at length recurved, linear, acute, with undulate margins, 1.5 cm. long, 4 mm. wide. *Stamens* declinate, filaments 3.5—6 mm. long, appendiculate at the base, forming a staminal cup, 3 mm. long, somewhat lacerated above, with two lobes usually much exceeding the others; anthers 4 mm. long. *Capsule* globose, 8 mm. in diam.

Range.—R. S. Afr.: Transvaal.

Notes.—According to L. Bolus (1938), although *N. transvaalensis* is closely allied to *N. frithii,* the former is sufficiently different to rank as a distinct species because of its narrower tepalsegs, longer and more slender filaments, and the differently shaped stamen-appendages.

25. Nerine hesseoides L. Bolus, in Fl. Pl. S. Afr. 18: pl. 683. 1938; Dyer, Herbertia 15: 14, pl. 315, fig. 2. 1948.

Plant glabrous, 17—25 cm. tall. *Bulb* ovate, up to 3 cm. long, 1.7 cm. in diam., continued into a neck, tunics thin, papery. *Leaves* 2—7, present with the flowers (synanthous), linear, flat or slightly sulcate above, rounded below, up to 18 cm. long, 1—1.5 mm. wide. *Scape* terete, up to 25 cm. long, scarcely 2 mm. in diam. *Spathe-valves* up to 2.5 cm. long. *Umbel* 6—14-flowered, centripetal. *Pedicels* ascending or erect, 2—3 cm. long. *Tepalsegs* regularly placed as in the genus *Hessea,* linear, widened upwards, broadest near the middle, obtuse, margins conspicuously undulate in the lower part, usually up to 1 cm. long, up to 3.5 mm. wide. *Stamen-filaments* at first decurved, then erect, finally almost regularly disposed in the flower, unequal in length, 4—5.5 mm. long, appendiculate at the base, the appendages almost free to the base, somewhat spreading upwards, narrow, acuminate, usually entire, up to 2 mm. long; anthers before dehiscence 1—2 mm. long, pollen whitish. *Style* at first decurved, finally curved upwards; stigma minutely lobed. *Ovary* at first acutely angled, 1.5—2 mm. long, 1.5 mm. in diam. *Capsule* globose, 6 mm. in diam.

Range.—R. S. Afr.; Griqualand West; Hay Division, Rocklands.

Notes.—According to Bolus (1938), there are four allied species, occurring in the north . . . *N. rehmannii, N. transvaalensis, N. frithii* and *N. hesseoides.* They are all glabrous and have in common slender synanthous leaves, flowers which rank among the smallest in the genus, and tepalsegs distinctly broadest near the middle, with margins closely and conspicuously undulate in the lower part, and obscurely so upwards. *N. rehmannii* is distinguishable by its white perigone and non-appendiculate filaments; *N. transvaalensis* has narrow tepalsegs and longer and more slender filaments than *frithii* and *hesseoides,* and finally, *N. hesseoides* differs from *N. frithii* in its smaller flowers, with the perigone actinomorphic throughout the entire life of the flower, and entire stamen-appendages which are separate from one another almost to the base.

26. Nerine gaberonensis C. E. B. Bremekamp & A. A. Obermyer, in Ann. Transvaal Mus. 16: 409. 1935; Plant Life 9: 75. 1953.

Bulb globose, 1.5—2 cm. in diam., continued into a cylindric neck 2.5—3 cm. long; tunics gray. *Leaves* filiform, glabrous, up to 10 cm. long, 1 mm. in diam. *Scape* terete, glabrous, about 15 cm. long. *Spathe-valves* (triangular), acute, 1.5 cm. long, 3 mm. wide. *Umbel* 14—15-flowered, centripetal; perigone wine-red, 2 cm. long. *Pedicels* terete, glabrous, 1.5—2.5 cm. long. *Ovary* globose, glabrous, 2 mm. in diam., 1 ovule per locule. *Tepaltube* 3 mm. long. *Tepalsegs* linear, or linear-oblanceolate, 3-nerved, obtuse, undulate, 1.7 cm. long, 2 mm. wide. *Stamens* inserted in the throat of the tepaltube, shortly connate at the base, in two series, the 3 longer 1.7 cm. long, the 3 shorter 1.4 cm. long; anthers 3 mm. long, oblong, emarginate at the apex and base, dorsifixed. *Style* filiform, 2.2. cm. long; stigma obscurely tricuspidate. *Capsule* deeply 3-lobed, membranous.

Range.—Botswana, Gaberones.

Notes.—According to the authors of this species, *N. gaberonensis* is closely related to *N. rehmannii,* but it is distinguished by the short tepaltube, the dark wine-colored and somewhat larger flowers and the gray bulb tunics. The spongy character of the bulb-neck protects the young shoot in the daytime against the excessive temperatures of the surface layers of the soil.

First collected by G. van Son, March, 1930.

27. NERINE PANCRATIOIDES Bak., in Gard. Chron. ii(1891)576; Fl. Cap. 6(2): 213—214. 1896; O'Brien, in Flora and Sylva 3: 122. 1905.

Bulb unknown. *Leaves* above 30 cm. long, bright green, subterete in the lower part, nearly flat towards the apex, 2 mm. in diam. *Scape* robust, terete, up to 60 cm. long. *Spathe-valves* lanceolate, 2.5 cm. long. *Umbel* 10—20-flowered, centripetal; perigone pure white, 2—2.5 cm. long. *Pedicels* 2.5—3.8 cm. long, densely pubescent. *Tepaltube* short. *Tepalsegs* oblanceolate, 4 mm. wide, not crisped. Stamens less than half as long as the tepalsegs. Stamens declinate; filaments filiform, alternating with large, square bifid scales; anthers small, black, oblong. *Style* very short.

Range.—R. S. Afr.: Natal, in a ravine on a hill near Greytown, alt. 1,220—1,524 m.; and Weenen County at Waterfall No. 7, alt. 1,524—1,828 m.

Notes.—Living material is needed for study.

28. NERINE APPENDICULATA Bak., Gard. Chron. ii(1894)336; Fl. Cap. 6(2): 213. 1896; van Druten, Fl. Pl. S. Afr. 31: 1211. 1956.

Bulb ovoid, 2.5 cm. long, 2 cm. in diam. *Leaves* 1—3, produced with the flowers, or occasionally absent, linear, deeply channeled, up to 45 cm. long, 2.5—5 mm. wide. *Scape* glabrous, terete, slightly twisted, up to 80 cm. long. *Spathe-valves* 2, lanceolate, membranous, reddish, 3.5 cm. long. *Umbel* 10—20-flowered, centripetal. *Pedicels* 3.5—5 cm. long, tinged with reddish-brown, very finely and densely pubescent with cellular hairs; bracteoles filiform, up to 3 cm. long. *Ovary* 3-angled, 6.4 mm. in diam., pubescent; ovules 2—4 per locule. *Tepaltube* very short. *Tepalsegs* oblanceolate-linear, 2.5—3 cm. long, 3—5 mm. wide, upper half crisped, minute pubescence at the base which sometimes extends along the keel a short distance; the color varying from pale to deep rose (red according to Baker), with deeper mid-vein. *Stamen-filaments* pale to deep rose in color; three 1.5—2 cm. long, three a little shorter, appendages conspicuous, white, up to 1 cm. long, with 2—4 linear teeth; anthers black, 3.5 mm. long. *Style* 8—17 mm. long; stigma minutely 3-lobed.

Range,—R. S. Afr.: Natal.

Notes.—First described by Baker from a cultivated specimen sent to him by Jas. O'Brien in 1894; the more detailed description by van Druten supercedes the sketchy one by Baker.

29. NERINE MASONORUM L. Bolus, in S. Afr. Gard. 20: 148, fig. A.

1930; Barker, in Fl. Pl. S. Afr. 15: pl. 570. 1935.

Bulb oblong-globose, 1.5 cm. in diam., continued into a short neck, tunics membranous, dark brown. *Leaves* 4—5, appearing with the flowers (synanthous), suberect or spreading, filiform, concave above, convex below, bright green, smooth, up to 20 cm. long, 1.5 mm. wide. *Scape* terete, minutely pubescent with pluricelled hairs, up to 22 cm. long, 2.5 mm. in diam. *Spathe-valves* lanceolate, acute, tinged with purplish-brown, 2.5 cm. long. *Umbel* 4—12 flowered. *Pedicels* pubescent, 1.2—3 cm. long. *Tepalsegs* up to 1.3 cm. long, 3 mm. wide, rose-pink with a darker central stripe, undulate, finally usually all recurved towards the back of the flower and away from the stamens. *Stamens* declinate, with two small lanceolate appendages attached to the base of the filaments, up to 7 mm. long. *Ovary* sub-acutely angled, glabrous, 2.5 mm. in diam.; style declinate, shorter than the stamens, even in the old flowers; stigma minutely 3-lobed, capitate.

Range.—R. S. Afr.: Cape Province, Transkei, near Mquanduli.

Notes.—According to Barker, the two nearest allies of *N. masonorum* are *N. parviflora* and *N. frithii.* It has the slender synanthous leaves common to both allies, and the glandular pubescence of *N. filifolia.* But the small flowers with the final position of the tepalsegs resulting in a perigone flattened in the center, the short stamens appendiculate at the base and throughout exceeding the style in length, are all features shared with *N. frithii,* which differs, however, in being quite glabrous, with more spreading and stiffer pedicels, tepalsegs definitely widest just above the middle, and stamen-appendages much larger and incised.

30. NERINE GRACILIS R. A. Dyer, in Fl. Pl. S. Afr. 17: pl. 679. 1937; Herbertia 15: 13—14, pl. 315, fig. 1. 1946(1948).

Bulb elliptic-globose, 1.5—2 cm. in diam., continued into a neck 3.5—5 cm. long, tunics membranous. *Leaves* 3—5, contemporary with the flowers (synanthous), up to 30 cm. long, 1.5—2 mm. thick, filiform, subterete, concave or shallowly canaliculate above, very minutely papillate. *Scape* terete, slender, shorter than the leaves, up to 20 cm. long, 2—2.5 mm. thick, very minutely papillate and occasionally with a few scattered hairs. *Spathe-valves* narrowly lanceolate-acuminate, about 2 cm. long. *Umbel* 8—10-flowered, centripetal, the anthers of the flowers maturing before the pistil (protrandrous). *Pedicels* 4—7 cm. long, 1 mm. in diam., terete. *Ovary* triangular. *Tepalsegs* about 1 cm. long, setepalsegs about 4.5 mm. wide, petepalsegs slightly broader. elliptic-oblong, rose-pink (Ridgway XII), green keeled above the middle, margins undulate, minutely cuspidate at the apex. *Stamen-filaments* appendiculate behind the base with oblong deeply 2—3-lobed rarely fimbriate process, at first suberect, later decurved after dehiscing of anthers; anthers oblong, 2.5 cm. long the 3 opposite the petepalsegs maturing before the others. *Style* at first decurved, later erect; stigma minutely trilobed. *Capsule* obtusely trilobed or subglobose, with 1—2 subglobose seeds per locule.

Range.—R. S. Afr.: Transvaal, between Bethal and Ermelo, in grassland, flowering in February (Southern Hemisphere).

Notes.—According to Dyer (1937), *N. gracilis* differs from *N. frithii* in the smaller, more regularly shaped flowers, and in the short but comparatively broad tepalsegs. It is generally glabrous, but may have a few scattered, transparent hairs, and when fresh is very minutely papillose on both leaves and scape; the papillae, however, disappear in drying.

HYBRID NERINES

William Herbert was among the first to work in this field. As shown in Table 3, Herbert recognized seven *Nerine* hybrids, but according to Baker (1896), these had all disappeared by the 1890's. Baker (1896) gave a list of 14 hybrids which were current at that time as shown in Table 3, but these apparently did not include all of the hybrids grown in his day. However, *Nerine* hybrids not included in his list were few in number.

Table 3. **Nerine** hybrids reported by Herbert (1837) and Baker (1896).

I. HYBRIDS REPORTED BY HERBERT (Amaryll. 1837)

1a. Umbel centripetal:
  1. x **mitchamiae** Herb. (curvifolia x undulata); Syn.—**versicolor** Herb.
  2. x **haylockii** Herb. (curvifolia x undulata)
  3. (pulchella x undulata)

1b. Umbel centrifugal:
  4. x **spofforthiae** Herb. (venusta x undulata)

1c. Type of umbel undetermined:
  5. (pulchella x humilis)
  6. (humilis x undulata)
  7. (curvifolia x venusta)

II. NERINE HYBRIDS LISTED BY BAKER (Fl. Cap. 1896)

1. x **amabilis** (pudica x humilis)
2. x **camii** (curvifolia x undulata)
3. x **atrosanguinea** (plantii x flexuosa)
4. x **cinnabarina** (fothergillii x flexuosa)
5. x **o'brienii** (pudica x plantii)
6. x **carminata** (pudica x plantii)
7. x **caerulea** (pudica x plantii)
8. x **erubescens** (flexuosa x undulata)
9. x **elagans** (fllexuosa x rosea)
10. x **meadowbankii** (sarniensis x fothergillii)
11. x **mansellii** O'Brien (flexuosa x fothergillii)
12. x **roseocrispa** Cam (undulata x flexuosa)
13. x **excellens** T. Moore, in Florist 1887, pl. 567 (flexuosa x humilis)
14. x **stricklandii** O'Brien, Gard. Chron. xvi (1894)690 (curvifolia x pudica)

Since 1896, no attempt was made to list hybrid nerines until the American Amaryllis Society (now affiliated with the American Plant Life Society), was organized in 1934, when all named amaryllid clones, including *Nerine* hybrids, were again recorded or registered.

The registration activity of the American Plant Life Society was recognized in 1962, when at the XVIth International Horticultural Congress, held at Brussels in August-September, the Council of the International Society for Horticultural Science designated the American Plant Life Society as the Official International Registration Authority for the cultivars of *Nerine* (see Plant Life 1963, page 63).

Emma D. Menninger, Registrar for Nerine Clones, prepared for the American Plant Life Society, a ''Catalog of Hybrid Nerine Clones, 1882-1958'' which was published in Plant Life 16: 63—74. 1960. Annual supplements have been published in succeeding volumes. In 1966 a revised registration form, worked out by Mrs. Emma D. Menninger, was adopted. The number of named hybrid *Nerine* clones is more than 350.

A comprehensive list of chromosome numbers of *Nerine* hybrids was published by E. K. Janaki Ammal and Margery Bridgwater in the Journal of the Royal Horticultural Society for October, 1951 to which the reader is referred.

Recently, The Nerine Society was organized in England with C. A. Norris, Clent House, Clent, Worcestershire, Great Britain as President and Editor. The first bulletin was published in 1966.

Thus, the Nerines are at long last receiving the attention that they deserve.

BREEDING FOR SIMPLIFIED NERINE CULTURE

The popularization of hybrid Nerines has been retarded by difficulties experienced in mastering cultural problems. The writer has experimented in this area, and limited success has been achieved at least in one direction. This concerns evergreen hybrids which can be grown at least in southern California under ordinary garden and pot culture without resting the bulbs. The clones obtained so far are sterile, but in a few cases some pollen is produced, and there is the possibility that some fertile hybrids may be obtained in the future. The hybrids are all quite beautiful ornamental plants.

Nerine x **traubianthe** Moldk.

(In Plant Life 23: 61. 1967.)

Since various *Nerine* species grow under different climatic conditions, the hybrids developed from them respond best to the culture similar to that needed by one or the other of the parents. The problem is to choose the right parents.

In order to simplify cultural requirements, the writer selected the evergreen *Nerine filifolia* (seed parent) and crossed it with such hybrid clones as 'Rosalba', 'Inchmery Kate', etc. This has given *evergreen, free-flowering* progeny intermediate between the parents, having linear leaves, and very long scapes due to hybrid vigor, and which can be treated as ordinary pot plants (grown in *plastic pots*) that are watered throughout the year. They invariably bloom in September through early November under this neglectful culture. When he has forgotten that they are around, they will surprise the gardener by the profuse flowering. Some of these clones (such as *N. filifolia* x 'Rosalba') increase rapidly by the splitting of the bulbs vertically; others (such as *N. filifolia* x 'Inchmery Kate', with thicker scapes) will have to be *cut into quarters vertically* after flowering and replanted in order to obtain the needed vegetative increase.

At first thought, the relatively long scapes might appear to be a disadvantage. However, when *several bulbs* are grown in a pot, the scapes are a little shorter; and as cut flowers the long scapes are an advantage since the florist or flower arranger may cut them to any desired length.

This series of hybrids, included under *Nerine* x *traubianthe,* is recommended to the amateur and the florist.

Other hybrid combinations, using different parents of easy culture, with the objective of simplifying culture have also been made, and the results will be reported later.

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HAMILTON P. TRAUB
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SUPPLEMENT—REVIEW OF THE GENUS NERINE

Page 3, text, 13th line, delete "it" after replaced.
4th par. 2nd line, change "Table 1" to "Tables 1 & 2"
Page 6, under CARYOLOGY, 5th line, change Table 2 to "Table 3". Change table heading "Table 2" to "Table 3."
Page 10, under 23b., 2nd line, change "*N. alata*" to "*N. alta*" under 29b, change "11. *alata*" to "*N. alta*"
Page 14, 9 lines from bottom, change "2c." to "2e."
Page 17, under 4g., Notes, 2nd line, change "species" to "variety"
Page 21, change "11. *alata*" to "11. *alta*"
Under "Notes", change "*Nerine alata*" to "*Nerine alta*"

PLANT LIFE LIBRARY—continued from page 166.

DRIFTWOOD MINIATURES, by Florence M. Schaffer. Hearthside Press, 381 Park Av. S., New York, N. Y. 10016. 1967. This charming book on creating driftwood miniatures represents a widening viewpoint in this field. The topics discussed include rocks, cones, nuts, hulls, pods, seeds, seed heads, roots, spathes, bracts, tendrils, coral, fungi, seaweed, coral and shells. It is written for a wide audience, including four-year olds, teenagers, young adults and senior citizens. This beautifully illustrated book is very highly recommended.

NEW IDEAS FOR CHRISTMAS DECORATIONS, by Nora Fields. Hearthside Press, 381 Park Av. S., New York, N. Y. 10016. 1967. Pp. 160. Illus. $4.95. This fascinating book on new ideas for Christmas decorations with greens, pods and cones by an authority in the field of education fills a definite need. It provides creative work for the members of the family in celebrating the Holiday season. Highly recommended.

HOW TO PLAN & PLANT YOUR OWN PROPERTY, by Alice R. Ireys. William Morrow & Co., 425 Park Av. S., New York, N. Y. 10016. 1967. Pp. 182. Illus. $7.95. This is an outstanding new type of book on landscape design which provides practical directions. The beautiful and practical illustrations alone are worth the price of the book, which is divided into three parts: (a) fundamentals, planting design, etc., (b) plans for landscaping various types of property; and (c) gardening details. This delightful and useful text is very highly recommended.

FLOWERS FOR YOUR CHURCH, by Adelaide B., and Lois Wilson. William Morrow & Co., 425 Park Av. S., New York 10016. 1967. Pp. 148. Illus. $6.95. This is the first complete guide for the arrangement of flowers in traditional and modern church buildings. This profusely illustrated text by two outstanding authorities is very highly recommended.

GREENHOUSE GARDENING FOR FUN, by Claire L. Blake. M. Barrows & Co., 425 Park Av. S., New York, N. Y. 10016. 1967. Pp. 256. Illus. $6.95. This book has been planned as a complete guide to greenhouse gardening for the amateur and sub-professional. The book is divided into four parts: (a) the program of plants to grow; (b) the first year-program, and more advanced plans; (c) plants to grow in the greenhouse; and (d) useful lists and guides. Highly recommended.

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Amaryllis aulica

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1968

Year Book of
The American Amaryllis Society
35th Issue

GENERAL AMARYLLID EDITION

EDITED BY
HAMILTON P. TRAUB
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[THE AMERICAN AMARYLLIS SOCIETY—continued on page 167.]

PREFACE

The cover design, by Prof. Penrith B. Goff, of the University of Kentucky, represents *Amaryllis aulica* as grown by Sam Caldwell in Tennessee from bulbs imported by Robert D. Goedert from South America. Prof. Goff is to be congratulated again on another beautiful cover.

This thirty-fifth edition of the AMARYLLIS YEAR BOOK is dedicated to Dr. Robert P. Kahn, the noted pathologist in the United States Department of Agriculture, who received the 1968 WILLIAM HERBERT MEDAL in recognition of his outstanding contributions toward the advancement of the amaryllids. He demonstrated the mosaic virus disease in *Amaryllis* L., for the first time. This opens the path for its eventual control and eradication. Dr. Kahn contributes a charming autobiography and a review of the researches on *Amaryllis* mosaic virus disease from 1960 to 1967 in the present issue. The HERBERT MEDAL is presented to him with the congratulations of all the members.

It is our sad duty to report the death of prominent members of the Society.

Mrs. Mary G. Henry, of Gladwyne, Penna., an outstanding worker in the field of the amaryllids, died on April 16, 1967, while on a collecting trip in the Wilmington, North Carolina area. The readers should look up the autobiography which she contributed to Plant Life 1950 on the occasion when the HERBERT MEDAL was awarded to her. Her article on *Agapanthus africanus* var. *henryae* Traub, in the present issue is perhaps the last contribution which she wrote. It is fitting for all of the members in the North, South and elsewhere to grow this fine gem, the *pure white* miniature *Agapanthus africanus* var. *henryae,* to keep the memory of Mrs. Henry fresh in the years to come. The plant is hardy as far north as central Pennsylvania, is of easy culture, and can be increased from seeds and offsets. Material will be furnished to Prof. Claude W. Davis, University Hills Nursery, 470 Delgado Drive, Baton Rouge, La. 70808, so that members will be able to obtain it. However, they should give Prof. Davis a little time to work up a stock.

Mr. Morris W. Clint, the husband of Mrs. Katherine Clint, who together introduced many amaryllids from Mexico, died on April 8, 1967. Mr. Edward F. Authement, our efficient and beloved Registrar of Amaryllis names, died on July 20, 1967; and Mrs. Charlotte M. Hoak, well known to all amaryllid enthusiasts for her work with amaryllids, died on Sept. 3, 1967. In Memoriam notices appear in the present issue.

Again, Mr. Goedert reports on the 1966-1967 Amaryllis Season. Dr. Joseph C. Smith writes about new Amaryllis species collected by Dr. Ruppel in South America. Sam Caldwell reports on *Amaryllis aulica;* Mr. Mertzweiller, Buchmann and Fesmire discuss their Amaryllis breeding projects. Mr. Tisch writes on his experiences with amaryllids; Mr. Doran reports on *Amaryllis reginae* and *Crinum erubescens* in South America; and Mr. Buck writes about the appropriate use of Amaryllis blooms at a spring wedding. Mr. Beckwith D. Smith shares his enthusiasm on acquiring the Blue Amaryllis, *Worsleya rayneri.*

Mr Buck writes about his Daylily trip to Chicago, Hemerocallis breeding and the rare Bahama Islands *Hymenocallis*. Mr. Paul H. Williams examines the possibilities of various *Rhodophiala* species; Mr. Hannibal reports on *Crinum schmidtii;* and Mr. Corbett considers the asexual propagation of *Lycoris squamigera*. Dr. Zorbach has found that the honey of *Crinum asiaticum* is mainly sugar (sucrose). Prof. Ravenna contributes *Nothoscordum* notes. Mr. Caldwell provides valuable *Lycoris* notes, and give us the first *Lycoris* blooming chart.

Dr. Howard writes about his plant exploration trips into Guatemala and Mexico. There are reports on the 1967 Official Amaryllis Shows; contributions on Amaryllis show schedules, and the staging of Amaryllis shows by Mrs. Pickard and Mr. Mahan. There are still other contributions as shown by the table of contents.

Contributors to the 1969 issue of the AMARYLLIS YEAR BOOK are requested to send in their articles by August 1, 1968, in order to insure earlier publication of this edition. Unless articles are received on time, publication will again be delayed to June or July or even later as with some issues in the past. Your cooperation toward earlier publication will be greatly appreciated. Those having color slides or transparencies which they wish to use as the basis of illustrations, are requested to have black-and-white prints made, and to submit these with their articles.

December 15, 1967,
5804 Camino de la Costa,
La Jolla, California 92037

Hamilton P. Traub
Harold N. Moldenke

HERBERT'S "AMARYLLIDACEAE" (1837) REPRINTED

In the 1966 issue, the firm Verlag Von Cramer, 694 Weinheim, West Germany, reported that Herbert's "Amaryllidaceae" (1837), with an introduction by H. P. Traub, would be reprinted. Due to unavoidable circumstances, the publication has been delayed, but word has been received (December 1967) that the book will be available in the spring of 1968. Pre-publication or subscription price is $30.00; after publication the price will be $40.00. Send orders directly to the publisher.

PLANT LIFE LIBRARY—continued from page vi.

THE FRAGRANT YEAR, by Helen Van Pelt Wilson and Leonie Bell. M. Barrows & Co., 425 Park Av. S., New York, N. Y. 10016. 1967. Pp. 306. Illus. $10.00. This comprehensive book on fragrant plants by two outstanding authorities will be welcomed. The topics discussed include classification of scents; fragrant plants for the winter garden; for spring, early summer, mid-summer, and autumn; and cool window gardens. Highly recommended.

NEW TRENDS IN DRIED ARRANGEMENTS & DECORATIONS, by Mabel Squires. M. Barrows & Co., 425 Park Av. S., New York, N. Y. 10016. 1967. Pp. 128. Illus. $3.95. This text by an outstanding authority will be welcomed. The topics covered include contemporary arrangements; still life; collage; assemblage; abstract design; new variations for Christmas; sources of plants, and ways to dry them. Highly recommended.

PLANT LIFE LIBRARY—continued on page 20.

Dedicated to
Robert Phillip Kahn

HERBERT MEDALIST—ROBERT PHILLIP KAHN

ROBERT PHILLIP KAHN

AN AUTOBIOGRAPHY

I first became interested in plants as a senior in high school during weekend exposure in a relative's florist business. However, since my favorite subject in school was economics, I enrolled at Northwestern University, planning to major in some area of commerce. During my first semester, since I found a course in botany more to my liking, I transferred to the College of Agriculture, University of Illinois. I took all the required plant courses but deferred until a later date all required animal courses. In 1943, after 2½ years of college I entered the Army, and in 1949 I graduated from Officer's Candidate School. After 3½ years service including one year in Japan, I returned to the University of Illinois. I had no interest in the animal science courses so I transferred to the Department of Botany, receiving the B.A. degree with honors in botany in 1948 and a Ph. D. degree in plant pathology in 1951.

This explains how a ''city boy'' became interested in agriculture—an accounting I'm frequently called upon to submit.

I was born in Chicago on April 20, 1924, the son of Charles S. Kahn, a dentist, and Edith K. Kahn. I was raised near Lake Michigan in apartments surrounded by a maze of concrete and asphalt with plant life only to be found in the city parks and conservatories with an occasional privet hedge in front of buildings.

I married Judith Aronson, an art major at the University of Wisconsin in 1947, shortly after she received her B.A. degree. Our four boys, Charles, James, Andrew, and Jeff were born in 1951, 1953, 1956, and 1960.

I have been employed by the U. S. Government as a plant pathologist since 1952. During the past 10 years I have been with the Plant Quarantine Division, Agriculture Research Service, U. S. Department of Agriculture. I am presently responsible for detecting obscure plant pathogens, particularly viruses in vegetatively-propagated plants imported by the Department for research purposes. Many genera imported from foreign countries are prohibited by quarantine regulations because of hazardous pests or pathogens that do not occur in this country. The only exception is that prohibited plants such as potato, cherry, and many ornamentals may be imported under proper safeguard by the Department of Agriculture for research or educational purposes. The safeguards we use are based on growing the imported plants under strict quarantine for at least 2 years during which time they are checked for pests and pathogens. Most pests and pathogens can be detected by observation of symptoms or signs. However, observation is not satisfactory for detecting viruses. Neither the presence nor the absence of virus-like symptoms is indicative of the presence or absence of virus in plants. Many varieties of plants can be infected with virus without

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showing symptoms. Thus, like "Typhoid Mary", they act as carriers and could serve as sources for the infection of susceptible varieties. Many virus-like symptoms are not necessarily incited by viruses. For example, chlorosis might be incited by genetic factors, nutritional imbalance, or by virus infection. Similarly, variegation could be virus induced or of genetic origin, or even caused by spray injury.

I am therefore, a specialist in the detection and identification of viruses, particularly latent viruses and in addition, I conduct research in methodology to improve methods for detecting and characterizing viruses. Such research may lead to the description of new strains of already described viruses (such as the *Eucharis* mottle strain of tobacco ringspot virus) or to new undescribed viruses.

In addition to the virus detection program and conducting research to support this project, I am also interested in plant quarantine pathology. I have been fortunate in being able to participate in international symposia on this subject at the Glasshouse Crops Research Institute, Littlehampton, England in 1963; the Plant Virology Institute at Wageningen in the Netherlands in 1965; at the Escuela Agricola Pan Americana in Honduras in 1966, and most recently in an FAO-International Biological Program Symposium in Italy in September 1967.

It was as a specialist in virus detection and in plant quarantine that I first encountered Amaryllids. The Louisiana Society for Horticultural Research, through the late Dr. Ira Nelson, asked the Department of Agriculture to send a specialist to advise on quarantine matters in connection with a collection of imported amaryllids maintained at the Southwestern Louisiana Institute, West Lafayette. The Louisiana Society for Horticultural Research sponsored a trip for me to observe Dr. Nelson's collection and to make phytosanitary recommendations.

Since then I have maintained a small collection of foreign and domestic amaryllids, many of which were submitted by readers of this journal. From this collection I isolated 4 viruses:

(1) *Eucharis* mottle strain of the tobacco ringspot virus—a previously unreported and undescribed strain isolated from *Eucharis candida* from Peru.

(2) An as yet unidentified virus isolated from a domestic plant of *E. grandiflora.*

(3) Amaryllis mosaic virus.

(4) Cucumber mosaic virus.

As an outgrowth of investigations within this group, I published 4 papers, 3 of which were in collaboration with other colleagues:

1. Kahn, R. P. 1960. The present status of the amaryllis mosaic disease in the United States. Louisiana Society for Horticultural Research, Bull. No. 5, pages 24-30.
2. Kahn, R. P. and F. F. Smith. 1963. Transmission of a virus inciting amaryllis mosaic symptoms. Plant Life 19:133-143.

3. Kahn, R. P. and H. A. Scott. 1964. Serological relationships of cucumber mosaic virus and certain virus isolates that incite amaryllis mosaic symptoms. Phytopathology 54:360-362.

4. Kahn, R. P., H. A. Scott, and R. L. Monroe. 1962. *Eucharis* mottle strain of tobacco ringspot virus. Phytopathology 52:1211-1216.

In the first paper, I reviewed the literature and status of amaryllis mosaic in the U. S., and suggested control measures. In the second, we reported isolation of 2 mechanically transmissible viruses from amaryllids. We identified one of the viruses as cucumber mosaic virus and confirmed its transmission by aphids. In the third paper, we confirmed this identification on the basis of serological tests. In the fourth paper, we described a new strain of the tobacco ringspot virus isolated from *Eucharis*. The new strain was of academic interest to other plant pathologists because it did not incite ringspot symptoms in tobacco, yet serological relationships showed it was, indeed, a strain of the tobacco ringspot virus.

I wish to thank the members of the American Plant Life Society for awarding me the William Herbert Medal for 1968.

AMARYLLIS VIRUS RESEARCH—1960-1967

Robert P. Kahn

Plant Quarantine Division, Agricultural Research Service,
USDA, Glenn Dale, Maryland

When the author reviewed the status of *Amaryllis*[1] mosaic disease as of 1960 (3), he recommended control measures that were based on insecticides, resistant or tolerant species or varieties, and phytosanitation. These recommendations followed the concept that control of virus diseases is generally based on prevention rather than cure.

This 1960 review was concluded with the following statements concerning future research: ''A survey of the published literature of *Amaryllis* mosaic and its causal virus suggests to the author that *Amaryllis* enthusiasts may have to learn to co-exist with the *Amaryllis* mosaic disease, especially under field conditions. The situation may be alleviated if future research can develop virus-resistant or tolerant lines, provide a virus indexing program, or ascertain the mode of transmission. More information concerning transmission is essential to place virus-control measures on a more specific basis than may now be recommended.'' This missing information is now available as a result of reports that have appeared since 1960.

It is the objective of this paper (1) to review these reports and thus to bring amaryllid growers up-to-date with respect to *Amaryllis* virus research and (2) to suggest areas of future research and a means by which such research might be stimulated.

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[1] **Amaryllis** L. (1753); first typified by Herbert, 1819; (syn.—**Hippeastrum** Herb. 1821).

RESEARCH 1960-1967

As of 1960, we knew that the tomato spotted wilt virus (TSWV) infected amaryllids and we suspected that the *Amaryllis* mosaic was incited by a virus. A virus was implicated because of virus-like symptoms, the presence of microscopic inclusion bodies in cells, and natural spread under field conditions but there was no actual proof of a virus. No one had reported that an infectious agent could be isolated from a plant with mosaic symptoms and then be transmitted to a healthy plant which would subsequently develop the same mosaic symptoms. TSWV was known to be transmitted by thrips and mechanically (rubbing sap from an infected plant onto a healthy plant). The method of transmission of the incitant of *Amaryllis* mosaic was unknown although insects were suspected. Reports of seed transmission were conflicting. The earlier work on amaryllid virus has already been reviewed (1, 3, 4, 7).

In 1966 the author and Dr. F. F. Smith reported the isolation of 2 viruses from *Amaryllis* with mosaic symptoms (4). One virus which could be transmitted to healthy *Amaryllis* as well as other plants such as tobacco was identified as cucumber mosaic virus (CMV). We showed that the CMV was aphid- and mechanically-transmitted from *Amaryllis* to *Amaryllis* and other test plants but the virus was not seed transmitted. Isolation of CMV from amaryllids by other workers has been reported (See Literature Cited 1, 2, 3). Under an electron microscope CMV is characterized by spherical particles. A second virus was isolated which could be mechanically-transmitted from *Amaryllis* to *Amaryllis* with the production of typical mosaic symptoms but the virus could not be transmitted to other plants. The second virus was not CMV.

In 1967, Brants and van den Heuvel (1) isolated a virus from *Amaryllis* plants with mosaic symptoms which showed a characteristic flexuous rod shape under the electron microscope. The virus was not transmitted by aphids but was transmitted through a low percentage of the seed. The virus of Brants and van den Heuvel was not CMV or TSWV.

Dr. D. H. M. van Slogteren, Jr., at the Flower Bulb Laboratory, Lisse, the Netherlands (unpublished data) has also isolated a rod-shaped virus from amaryllids and has developed an antiserum which is useful in serological testing. This antiserum reacts with the second virus isolated by Kahn and Smith showing that both van Slogteren's and the Kahn and Smith virus are related. Dr. M. K. Corbett, University of Maryland (unpublished data) has also purified a rod-shaped virus from sap obtained from mosaic infected plants. After purification, a procedure whereby the virus as separated from other components of the cell sap by chemical and physical means, the virus would infect other non-amaryllid test plants suggesting that some amaryllid sap extracts contain a virus inhibitor which may interfere with mechanical transmission.

Three viruses found in *Amaryllis* and some of their characteristics are indicated in Table 1.

Table 1. Some characteristics observed in viruses found in **Amaryllis** L.

CHARACTERISTICS	VIRUSES Tomato Spotted Wilt	 Cucumber Mosaic	 Amaryllis Mosaic Virus
Symptoms	yellow spots[1]	mosaic	mosaic
Particle shape in electron microscope	spherical	spherical	flexuous rod
Insect transmission	thrips	aphids	not demonstrated
Mechanical transmission	yes	yes	yes
Seed transmission	not demonstrated	not demonstrated	reported (low percentage)

[1] Plus mosaic symptoms reported by Brants and van den Heuvel.

These characteristics suggest that the recommendations for control as described previously for both greenhouse and field-grown amaryllids (3) should be retained.

FUTURE RESEARCH

Virus-free propagations have been obtained from virus-infected plants as a result of heat therapy. Virus-infected plants are grown under continuous temperature of 97°-100°F in plant growth chambers with artificial lights or in greenhouses for 1 to 6 months depending on the ability of the plant to withstand high temperature. Under these conditions, virus may not move up into growing points as new growth develops. The meristems or growing points about 0-2 mm in length are aseptically removed and cultured on nutrient medium containing sugar, vitamins, growth regulators, and mineral elements and sometimes cocoanut milk. The meristems develop into plants which are then transplanted to soil. If meristems are not used, tip cuttings or buds are removed and propagated. Each meristematic bud or cutting propagation is then tested for virus in order to locate the small percentage that might come through free of virus.

Heat-treatment therapy has already been successfully used to free virus-infected cherries, chrysanthemums, carnations, strawberries, grapes, potatoes, and several other plants. Orchids have been freed of virus by meristem tip culture even without heat therapy.

Another application of meristem tip culture and of other forms of tissue culture is in vegetative propagation. Using these techniques one can increase valuable clones such as show orchids or difficult-to-propagate plants such as certain lily varieties.

As far as the author is aware, no one has reported the application of heat therapy techniques to produce virus-free plants or tissue culture to multiply valuable clones of amaryllids. The nearest approach was that of Dr. F. O. Holmes who used a specialized form of propagation and succeeded in developing virus-free plants from infected plants (4). He found some virus-free bulblets among those that were regenerated when stem pieces (free of leaves) were placed on sand under mist.

STIMULATING RESEARCH ON AMARYLLID VIRUSES

The host-virus combinations that have been investigated in heat-therapy projects have been economically important crops for the most part. Apparently, amaryllids despite their beauty and the enthusiasm of amaryllid growers, are not economically important enough to stimulate research in this area if left to their own merits.

One method that has been used to stimulate research at state or private universities is the setting up of a graduate fellowship or assistantship or grant. Under this procedure the student receives credit for half-time on the project and support towards his education for the remaining half-time. Thus, he works full time on the project.

Other groups of growers such as orchid or rose growers have contributed money in the form of outright grants or assistantships to various institutions. These funds are ear-marked for research in the crop of interest to the contributors.

It is my suggestion that amaryllid growers give some thought towards establishing a grant or assistantship at a university where heat-treatment facilities have been established. The grants or fellowship should be set up specifically to investigate the application of heat treatment and tissue culture techniques towards the production of virus-free amaryllid plants and the multiplication of clones that are difficult to propagate by standard vegetative means.

If the techniques can be successfully applied to amaryllids, many important clones could be rendered virus-free. This is especially important where the clone is universally infected—a situation which develops when a new hybrid seedling becomes virus-infected since all vegetative propagations of the clone would also be virus-infected.

The advantage of developing virus-free stocks is that the buyer of amaryllids would be assured at the time of purchase that the bulb is virus-free.

However, it should be understood by both the commercial supplier of bulbs and the buyer that virus-free clones could be re-infected particularly under field conditions. Virus-free plants that are derived from infected plants are not immune to re-infection. Consequently, commercial growers and buyers would still need to apply preventative control measures.

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JET FLIGHT TO SEE DAYLILIES IN CHICAGO—1967

W. QUINN BUCK, *Chairman, Daylily Committee,*
The American Plant Life Society

A suggestion that the exceptionally good season of 1967 would make it an ideal time to visit Chicago, coupled with an invitation and an offer to be guided by Mr. Clarence J. Blocher, caused your chairman to decide to make the trip and see the gardens from which have come so many important daylilies in recent years.

After an exhilarating flight, our plane reached O'Hare Airport shortly before 4 P. M. on July 19, and Mr. Blocher met us and took us immediately to Mission Gardens in Techny, where we met Bro. Charles and some of his prominent visitors, including Dr. Robert A. Griesbach, Dr. George M. Darrow, Mrs. W. T. Hardy from Alabama, and others. Bro. Charles' tetraploid daylily seedlings were quite overwhelmingly wonderful, as we had been told that they would be. From here we hurried to Northbrook to have a brief look at the Orville W. Fay garden before it got too dark. We were pleased to get to meet Mr. and Mrs. Fay and their guests and to get to visit for a while after seeing the daylilies, which we found extremely exciting because of the wider color range included in the Fay tetraploids. When poor light drove us in, we had a chance to see Mr. Fay's collection of Dykes Medals and Stout Medals, and other treasured possessions.

At our motel in Wheaton we found that R. W. Munson, Jr., and his mother Mrs. Munson, Sr., and a young niece had arrived from Florida in the afternoon. More daylily talk was in order, until quite late.

On Thursday the whole party went first to Mission Gardens for a longer and better look at Bro. Charles' incredible melon seedlings, and we found many more new ones open. Steve Moldovan had arrived from Ohio and was in the field studying the seedlings. We went next to Mr. Fay's for a good look at his field in the hot, bright sun. The delightful thing to see again was the color range, as well as the unexpected colors to be gotten from crosses of 'Crestwood Lucy' and 'Gertrude Smith' with other clones.

The next stop was at the Nathan H. Rudolph garden in Aurora, where we found disappointingly little in bloom as yet. Then after seeing Mr. Blocher's gardens in Wheaton, we had a buffet luncheon in their home. We found Mrs. Blocher to be one of those very important wives who do much of the pollinating.

Our next stop was the too small back yard of Dr. Robert A. Griesbach in Park Ridge. The color spectrum of the tetraploid seedlings here was very wide, with impressive numbers of good reds, roses, and pinks; high quality yellows, golds, and melons were here also, but they were in the minority. Our visit had to be unsatisfactorily short as this garden warranted extended close study.

The last garden of the afternoon was the James E. Marsh garden in Chicago, famous for both iris and daylilies. The whole backyard was a mass of bright color as all the various beds seemed to be in full bloom. Nearer the house the beds contained a large number of named clones and superbly grown clumps of the Marsh daylily introductions. Further back the beds contained seedlings, both diploid and tetraploid. We got to see other beds of seedlings being grown in the yards of good neighbors. Our regret here, too, was that we had had so little time in which to try to see so much.

Friday was spent mainly in close study of the plants at Mission Gardens, where many new seedlings were opening each day. In the afternoon there was another visit to the Fay garden, which needed rain.

Saturday morning was likewise spent taking notes on Bro. Charles' fine display. Among visitors at Mission Gardens were old acquaintances, Mr. George Gilmer from Virginia, and Mr. George P. Watts from New York. Mr. Watts was kind enough to take me along for a brief visit with the David F. Halls in Wilmette. It was a privilege to meet Mr. Hall and see his garden full of favorite varieties, many of which looked very different in a rain-watered garden in Illinois as compared with how they grow in irrigated California. 'Lady Inara', which has long been a favorite, was completely different in growth and stature, for example. 'May Hall', 'Wilmette', 'New Light', and many other fine clumps sparkled in this jewel garden among the old elms.

After our return to Mission Gardens a heavy thunderstorm ruined many of the flowers for the day. Mr. and Mrs. Blocher returned soon after from picking up their younger daughter at camp, and we spent much of the afternoon in the Blocher garden, ending with a final visit to Mr. Fay's and a last look at 'Beautiful Lady' and many others in his field. Sunday morning saw me at O'Hare Airport early and at home in Arcadia before noon.

In retrospect and from studying my notes, certain things stand out: Bro. Charles had many of the finest melon tetraploids so far developed, and some of his yellows were quite wonderful. One could not help wishing for more of other colors in his tetraploids, but it was especially interesting to be able to see several generations of great progress in the melons, with many of the finest 1967 seedlings coming from 'Heavenly Harp' ('Crestwood Ann' x 'Changing Times'). A few of these fine offspring would include T67-31; T67-2; T67-66, in beautiful scale; T67-51, a lovely greenish yellow of nice height and excellent branching. Other very attractive seedlings of the new crop included T67-50; T67-79, T67-43, a gold-edged melon; T67-53, a yellow; T67-47, a round, ruffled melon; T67-36, yellow; T67-38, an especially beautiful, round, deep melon; T67-60, very sunfast; T67-67, very sunfast pink melon of magnificent substance; T67-80, well branched, flaring ruffled yellow-melon with very pink midribs; T67-45, lovely pie-crust edged, flat, medium sized round melon; T67-37, an ardent apricot melon; T67-28, a lovely bright pink-and-green melon; T67-62, flat tangerine melon. Among Bro. Charles' diploids there were some nice creamy yellow such as 'Ascending Angel', to be released, and 'Crystal Sunshine'; or such fine clones as 'Butter Curls', 'Little Rainbow', 'Cub Scout', and 'Toyland', this group being good miniatures. The truth is, however, that everything else was overshadowed by the tetraploids, no matter how good the diploids.

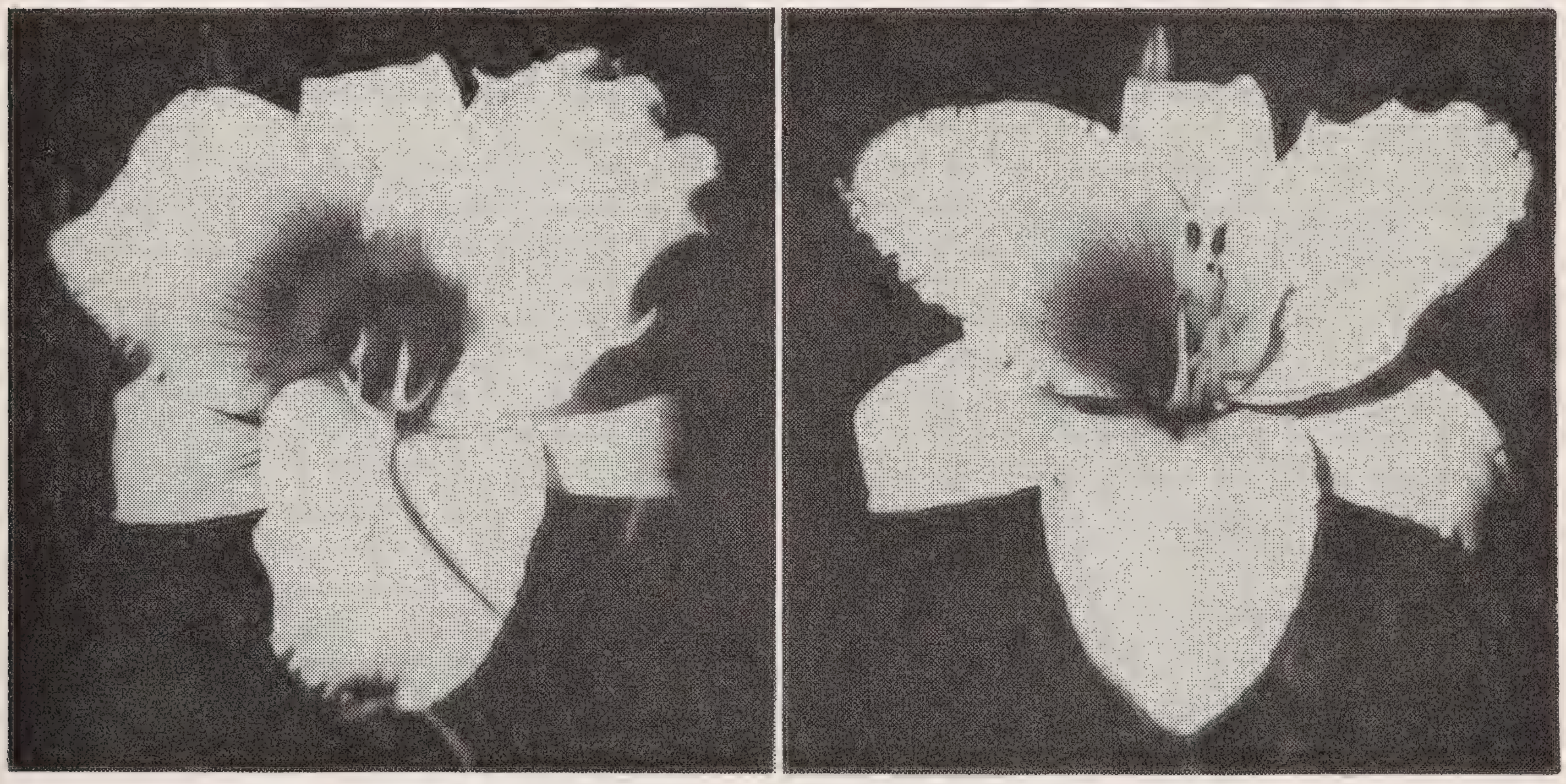

Fig. 2. Fay tetraploid daylily introductions: **left,** 'Kathleen Elsie Randall' (1965), and **right,** 'Lady Cynthia' (1966). Photos by Wallace D. Mulliken, M.D.

These two Fay tetraploid introductions are reported to be doing well in various sections of the country. In Arcadia the green-throated cream 'Kathleen Elsie Randall' may have been a bit more attractive than its sibling 'Lady Cynthia', but 'Lady Cynthia' set many more seed pods in 1967.

These two of the very finest of the Fay introductions from the Northbrook garden which has been contributing some of our most important tetraploid daylily parents in recent years.

The Fay seedlings could not be studied so closely as Bro. Charles', but there were many delights among them, such as the 1967 releases, 'Mary Todd', which Mr. Fay considers his finest yellow to date, and 'Golden Surrey', which should be an interesting parent because of the fringed edges of its tepalsegs. A few of the good new yellows were T67-36, T67-12, T67-18, and T67-22. T67-6 was a nice creamy melon, and T67-19 was a fine small apricot melon. From previous seasons, FT65-10 and FT65-32 were fine yellow parents; T65-9, T65-41, and T65-55 were fine rose colors; FT65-23 was a somewhat narrow petaled rose that showed promising color for breeding. T66-13 was an especially beautiful salmon; T64-17 was a beautiful pink; FT66-38 was a good red, showing less sunburn than many of the seedlings in this difficult color.

Everywhere were evidences of Mr. Fay's meticulous care and strict evaluations. Among his diploid seedlings were many, such as 'Beautiful Lady' and many of her offspring, that were amazingly fine not to have been released at all, and they merited further attempts at polyploidizing them so that they could be used in widening Mr. Fay's breeding program.

The tetraploids of Dr. Griesbach will gain real attention when they are disseminated and can be seen.

The really great progress of the tetraploid daylily and a promise of further and snowballing progress were the main conclusions drawn from this first trip to Chicago.

IN MEMORIAM—MORRIS WALKER CLINT, 1903—1967

It is with profound sadness that I must report the death of Morris W. Clint to readers of PLANT LIFE, on April 8th, 1967. Morris was the husband of Katherine Lamberton Clint, the "other half" of the man-wife team of plant enthusiasts, lovingly known to our readers as "The Clints". Readers of PLANT LIFE will recall the many plant exploration trips that he and his wife, Kitty, shared in Mexico the past decade or more and which actually began in 1946 when Morris accompanied a friend on an orchid collecting trip. Morris was bitten by the "collecting bug" and returned home to infect Kitty. They never recovered. Their joint efforts resulted in a vast collection of plants that would do justice to a botanical garden, and visitors were usually stunned speechless upon seeing it for the first time. Kitty always seemed to be calmly amused by this reaction, but Morris seemed to capture the enthusiasm, seeming to be as delighted with it all as if it were he seeing it for the first time. Few visitors ever left the Clint estates empty handed. While Kitty continued conducting the tour, Morris would slip silently away, returning with samples of plants that the visitor might have been raving over a few minutes earlier.

Morris died at the age of 64, after several years of living with a circulatory problem that had greatly curtailed his garden activities, and had stopped any further ventures of plant explorations in Mexico. His survivors include his wife, Kitty; two sons, Morris, Jr. and Alan M. Clint, both of Brownsville; a daughter, Mrs. Marcia Wilson of Galveston; and seven grandchildren.

The APLS and the plant world in general have been left poorer with his passing, and he will be sorely missed, but those who knew and loved him will be richer for the experience.—*T. M. Howard*

IN MEMORIAM—CHARLOTTE MILLIKEN HOAK, 1874—1967

Miss Charlotte Milliken Hoak died Sept. 3, 1967, in Pasadena, Calif., after seeming to be recovering from pneumonia. She would have been 93 on Oct. 24, 1967. She was buried in Evergreen Cemetery in Mendecino on Sept. 8. Miss Hoak was born in Comptche in Mendecino County, Calif., and grew up there. After attending the University of California in San Francisco, where she received a Master's degree, she moved to Los Angeles, where she taught botany and horticulture in the public schools for over 50 years.

Miss Hoak was particularly interested in the *Amaryllidaceae* and bulbs of all kinds, and many of her botanical, gardening, and horticultural writings dealt with them. She was a regular contributor to certain publications for many years, and she remained quite active in many areas of horticulture and garden club work up until just a few years ago. Miss Hoak is to be remembered as one of the real pioneers of California horticulture, along with Cecil Houdyshel, Carl Purdy, Theodore Paine, Kate Sessions, and a few others like them.—*W. Quinn Buck*

IN MEMORIAM—EDWARD FRANCIS AUTHEMENT, 1909—1967

Edward Francis Authement, our registrar of Amaryllis names, died suddenly on Sunday, July 20, 1967 at the age of 58 years. He had been hospitalized for quite some time and was apparently progressing nicely when he contracted pneumonia in mid-July which proved to be a load he was unable to cope with.

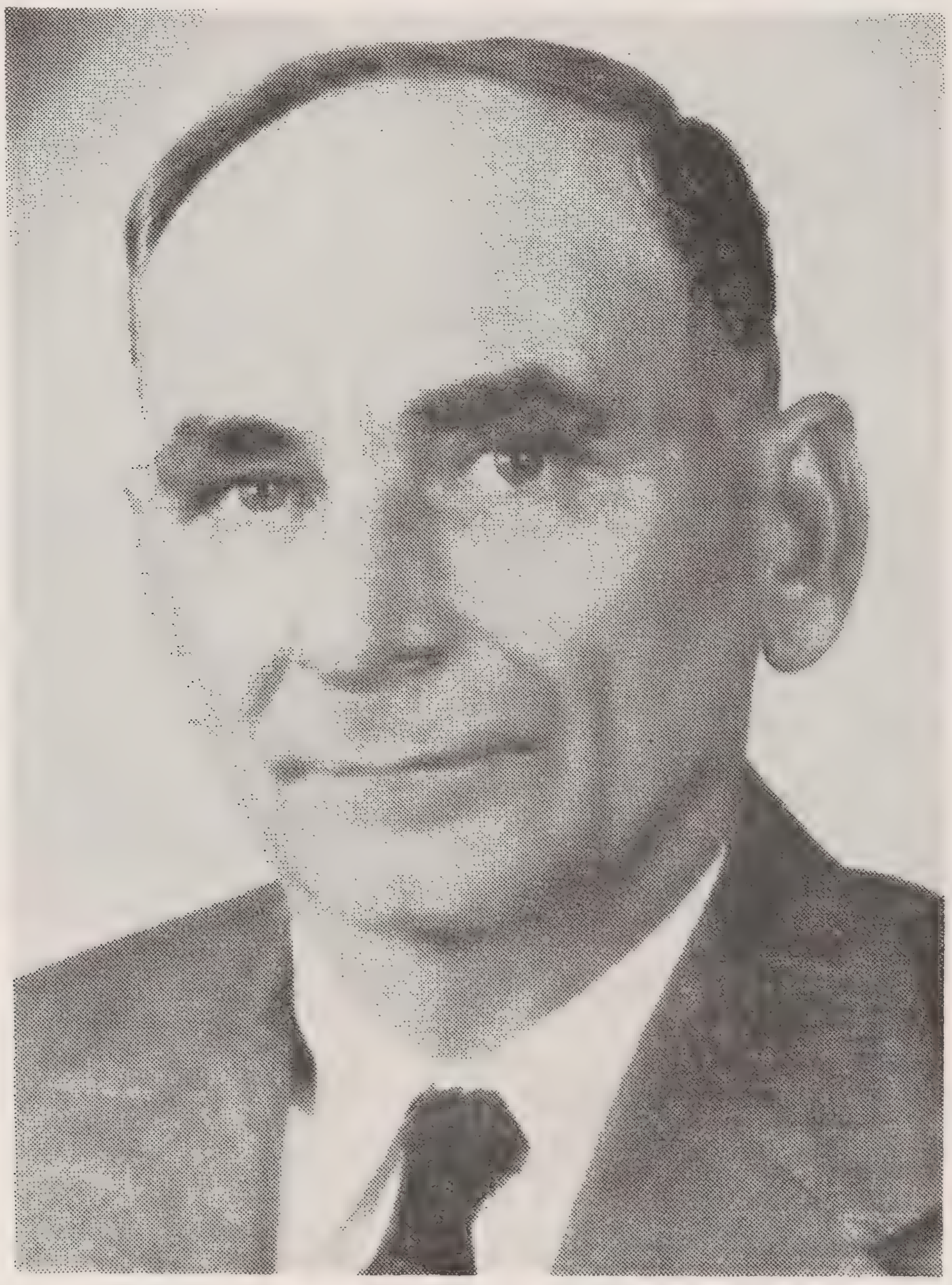

Fig. 3. Edward Francis Authement, 1909-1967

Mr. Authement was born in Cut Off, Louisiana, on March 12, 1909 where he attended local elementary schools and then attended La Rose High School in La Rose, Louisiana. Shortly after graduation, he moved to New Orleans and was employed by the Lone Star Cement Corporation in the capacity of diesel engineer.

On December 7, 1929 he married Miriam Gouget and three children were born of the marriage. He remained with the Lone Star Cement Corporation until December 1960, when he retired from that position. In October 1964 he accepted a position with the Sewerage and Water Board of New Orleans and held that position until his final illness caused his retirement therefrom in March 1967.

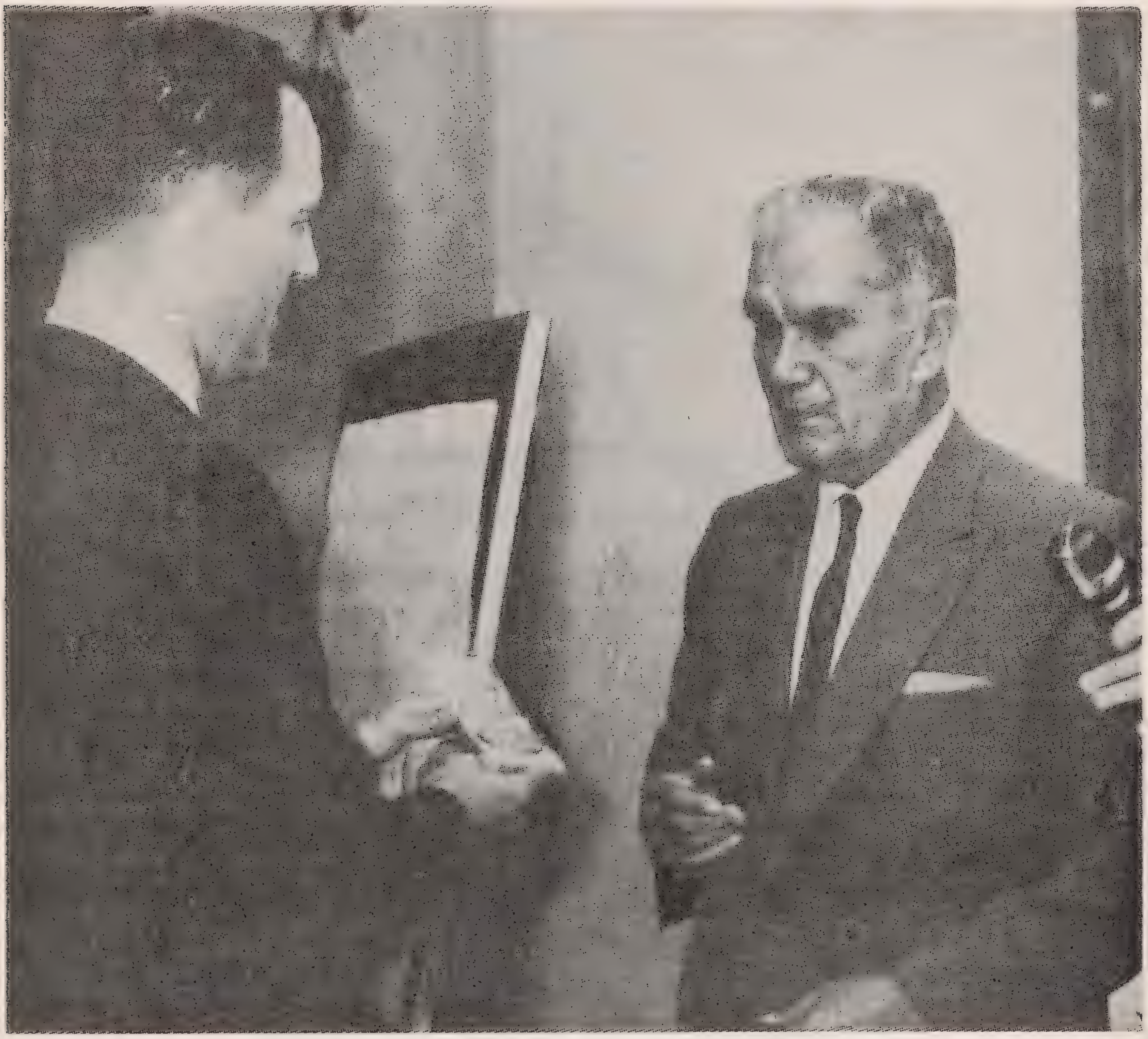

Fig. 4. Mr. Thomas I. Dickson, the American Vice Consul at Cochabamba, Bolivia, presenting the 1967 William Herbert Medal to Dr. Martin Cardenas on behalf of the American Plant Life Society, September 22, 1967. Photo *Los Tiempos,* Cochabamba, Bolivia.

For the past several years Mr. Authement had held the important office of Registrar of Amaryllis Names in the American Plant Life Society which he administered with efficiency and to the satisfaction of all the members. It was largely through his efforts that the ''Catalog of Hybrid Amaryllis Cultivars, 1799-1963'' was published in 1964. He reformed the exhibition schedule for the staging of Amaryllis shows.

He was a member of the Men's Amaryllis Club of New Orleans, having joined the organization shortly after its inception. He had held various offices in the Club and was a member of the Board of Directors. He had served once as Show Chairman at the annual show, and also served for a number of years as Chairman of the Classification Committee. In connection with his position as Registrar of the American Plant Life Society, he had given numerous lectures and was always happy to oblige any organization that requested any information or services concerning Amaryllis. He also held membership in the Louisiana Society for Horticultural Research and had attended many of the annual meetings of that Society conducted by the late Ira S. Nelson.

Needless to say, he was held in high regard and esteem by all who knew him and his passing will mean a great loss to the Men's Amaryllis Club of New Orleans, and also to the officers and members of the American Plant Life Society.

Mr. Authement is survived by his wife, Mrs. Miriam Gouget Authement, two daughters, one son, two sisters, two brothers, and twelve grandchildren.—*James E. Mahan*

HERBERT MEDAL PRESENTATION TO DR. MARTIN CARDENAS

In a ceremony at the *Centro Boliviano Americano,* the American Vice Consul Mr. Thomas I. Dickson, presented the 1967 WILLIAM HERBERT MEDAL to Dr. Martin Cardenas, September 22, 1967, on behalf of the AMERICAN PLANT LIFE SOCIETY. The event was covered by the United States Information and Cultural Services, and the newspaper, *Los Tiempos,* of Cochabamba, Bolivia. The readers are referred to the 1967 issue of the AMARYLLIS YEAR BOOK for the autobiography of Dr. Martin Cardenas. See Fig. 4.

TRAUB—**AMARYLLIS NOTES**, continued from page 50.

Haemanthus magnificus forma *gumbletonii* (Bak.) Traub, *comb. nov.* Syn.—*Haemanthus magnificus* var. *gumbletonii* Bak. Amaryll. 66 1888.

Haemanthus magnificus forma *insignis* (Hook.) Traub, *comb. nov.* Syn.—*Haemanthus insignis* Hook. Bot. Mag. pl. 4745. 1875.

Haemanthus magnificus subsp. *superbus* (Bak.) Traub, *comb. nov.* Syn.—*Haemanthus magnificus* var. *superbus* Bak. Amaryll. 66. 1888.

Haemanthus puniceus subsp. *membranaceus* (Bak.) Traub, *comb. nov.* Syn.—*Haemanthus membranaceus* Bak. Amaryll. 66. 1888.

PLANT LIFE LIBRARY—continued from page 4.

TREES AND SHRUBS OF MILLS COLLEGE, by Baki Kasaphigil. Mills College Publ. Office, Oakland, Calif. 94613. 1967. Pp. 56. Illus.-map. Paper, $1.95. This book lists with brief descriptions, 449 species or varieties of trees and shrubs, grouped under 236 genera, and 93 families, growing on the 127 acre campus of Mills College. Highly recommended.

EVOLUTIONARY BIOLOGY, VOL. I., edited by Th. Dobzhansky, M. K. Hecht and Wm. C. Steere. Appleton-Century-Crofts, 440 Park Av. S., New York, N. Y. 10016. 1967. Pp. 444. Illus. $14.00. Since evolutionary biology represents a unifying principle in the life sciences, the subjects covered in this series draw on various disciplines. In the first volume the subjects include chemical evolution; evolution of brain achievements; variation and taxonomy of the early hominids; adaptive radiation and trends of evolution in higher plants; permanent heterozygosity; use of computers in studies of taxonomy and evolution; chemical systematics; and genetic loads in maize and other cross-fertilized plants and animals. This stimulating volume is required reading for all biologists.

THE PHYSIOLOGICAL CLOCK, 2nd revised edition, by Erwin Buenning. Springer-Verlag New York, 175 5th Av., New York, N. Y. 10010. 1967. Pp. viii; 168. Illus. paper, $3.00. This series is designed for the scientist and also for interested laymen with some basic understanding of the sciences. In the first volume, the biological measurement of time by unicellular organisms, higher plants and animals, including man, which utilize periods of approximately 24 hours, is covered. The author discusses the present state of our knowledge of the physiological nature of this clock and the many means by which organisms use this mechanism.

SUNSET WESTERN GARDEN BOOK, by the Editors of Sunset Magazine, and Sunset Books. New Edition. 1967. Lane Books, Willow Rd., at Middlefield Rd., Menlo Park, Calif. 94025. Pp. 448. Illus. $5.95. This new edition of an outstanding practical gardening manual for the West will be welcomed. It outlines the West's 24 climatic zones; indicates how to grow and select plants for particular situations, garden color, and special effects. A gardener's glossary, an encyclopedia of 5,000 plants, and a subject index complete the book. Highly recommended to all gardeners.

GARDENING IN CONTAINERS, by the Editors of Sunset Magazine and Sunset Books. Lane Books, Willow Rd., at Middlefield Rd., Menlo Park, Calif. 94025. 1967. Pp. 96. Illus. Paper, $1.95. This attractive and profusely illustrated manual for growing plants in containers will be welcomed by all gardeners. The subject matter is grouped under four headings: (a) what is container gardening; (b) how to garden in containers; (c) what plants thrive in containers and (d) where to put them and how to use them. Highly recommended to all gardeners.

ADVENTURES WITH FLOWERS, by Elizabeth T. Billington. Frederick Ware & Co., 101 5th Av., New York, N. Y. 10003. 1967. Pp. 60. Illus. $2.95. This attractive book introduces children to an appreciation of flowers by giving brief historical notes; points for recognition of flowers, flower families, and managing a flower show; and brief references to flower myths, legends, etc. Highly recommended as a gift book for children.

NEW TRENDS IN FLOWER ARRANGEMENTS, by Rae L. Goldson. Hearthside Press, 381 Park Av. S., New York, N. Y. 10016. 1966. Pp. 122. Illus. $4.95. This profusely illustrated text on the new way for making flower arrangements by an outstanding authority will be welcomed by all interested in this subject. The topics discussed include good design; texture; variety, function; abstraction; simplicity, etc. Highly recommended.

CREATIVITY IN FLOWER ARRANGEMENT, by Frances Bode. Hearthside Press, 381 Park Av. S., New York, N. Y. 10016. 1967. Pp. 160. Illus. $5.95. This book recognizes the trend which demands that the floral arrangement has to be a creative work of art. The topics discussed include craftsmanship; bases and stands; plant materials; accessories; the art of observation, and personal expression. This beautifully illustrated book is very highly recommended.

PLANT LIFE LIBRARY—continued on page 32.

1. REGIONAL ACTIVITY AND EXHIBITIONS

THE 1967 AMARYLLIS SHOWS

The Official Amaryllis Shows for the year 1967 began on April 8-9 with the New Orleans Men's Amaryllis Club Show. The Garden Circle Amaryllis Club of New Orleans Show was held on April 15-16. Then followed the Greater Houston Amaryllis Show on April 16; the Hattiesburg (Miss.) Amaryllis Show on April 22; the Corpus Christi (Tex.) Amaryllis Show on May 3; and the Southern California Amaryllis Show at Arcadia on May 22-23. Mrs. Pickard reports that the peak of bloom was reached too early for the scheduled date of the Houston Amaryllis Society Official show, but fine blooms won high honors in some of the local flower shows, and individual gardens of members were opened to the public where many fine specimens were displayed. No report was received from the Greater Gulf Amaryllis Show (Mobile, Ala.), and it is assumed that this show was not held in 1967.

MEN'S AMARYLLIS CLUB OF NEW ORLEANS OFFICAL SHOW, 1967

JAMES E. MAHAN, *Show Standards Chairman,*

3028 Palmyra Street, New Orleans, Louisiana 70119

The Edward Hynes School, 990 Harrison Avenue, was again the scene of the official Amaryllis Show held by the Men's Amaryllis Club of New Orleans, Inc., on April 8 and 9, 1967. The winter was considerably milder than those of the past several years which contributed, perhaps, towards the increased number of entries received for the show, 185 in all. An increase was also noted in the number of visitors to the show.

As in the previous year, the show schedule was formulated to accommodate the nine Amaryllis divisions set forth by the American Amaryllis Society and to satisfy their requirements for an official show. Members of the Men's Amaryllis Club of New Orleans, Inc., accounted for a total of 118 ribbons, comprised of 32 blue, 35 red, 32 yellow and 19 white. The following trophies were given: the Walter Latapie award for the best registered and named specimen to Edward Beckham; the Norman Clements award for the best unregistered and unnamed specimen to Edward Beckham; the James Mahan award for sweepstakes winner in named and registered section to Milo Virgin; the Reuter Seed Company award for sweepstakes winner in unregistered and unnamed section to Milo Virgin; the Alatex Construction Service, Inc., award for the best home-bred, developed and grown specimen to Milo Virgin; the Swetman Amaryllis Garden award for sweepstakes winner in the registered and named sections, potted and cut specimens, to Milo Virgin; the President's trophy for most blue ribbons won by a club member to

Milo Virgin; and a club trophy for the winner of the best single floret specimen to Edward Beckham (open to club members only). A section was initiated this year to receive plants bearing scapes with two florets, which falls under the arrangements category. Special ribbons were awarded where deserving.

Through the courtesy of Mr. Emile Malbrough a display of rex begonias was set up in the foyer of the school and was very well received by the visitors to the show, estimated to be between 400 and 500. The heartfelt thanks of the club go to Mr. Malbrough for his kindness.

Messrs. Norman Clements and W. J. Perrin acted as show chairman and co-chairman, respectively, and the club's thanks go to them and to all others participating in the show for helping to make it the great success that it was.

1967 OFFICIAL GARDEN CIRCLE AMARYLLIS CLUB SHOW

MRS. A. J. HAYDEL, *Chairman,*

516 Gordon Ave., New Orleans, La. 70123

The sixteenth Official Amaryllis Show of the Garden Circle Amaryllis Club was held on Saturday and Sunday, April 15-16 with Mrs. A. J. Haydel as Chairman and Mrs. A. R. Oddo, President and Honorary Chairman.

This show was held in conjunction with the Federated Council of New Orleans Garden Clubs Show at the Club House of the picturesque Fair Grounds and attendance was very large. Early Spring weather, along with a late date, however, held down entries in the Amaryllis section of the show.

Trophy winners were Milo Virgin, Mrs. Edna Dopp and Mrs. W. J. Perrin. Preliminary Commendations were awarded to Mrs. A. J. Haydel and Milo Virgin.

GREATER HOUSTON OFFICIAL AMARYLLIS SHOW, 1967

MRS. SALLY FOX, *1527 Castle Court,*

Houston, Texas 77006

''Birds and bees'' spelled out the theme of The Greater Houston Amaryllis Club's fifth official show, ''Amaryllis Romance'', in the Garden Center on Sunday, April 16, 1967. An overflow crowd showed interest in viewing over 100 various type amaryllids, with the point of interest being the table with the silver trophies, along with Awards of Merit, for the best of each division in the show. Winners were:

Mr. Kermit L. Warnasch, 4018 Drummond—Ludwig Challenge Cup for Royal Dutch. Mrs. Chas. H. Pease, 11059 Timberline—Greater Houston Amaryllis Club trophy for Helen Hull, a double amaryllis. Mrs. Clint R. Black, 1832 Forest Hill—Covered dish for Sparkling Gem, a miniature. The above three were also awarded Awards of Merit from the American Plant Life Society.

Mrs. John Ellett, 7531 Satsuma—Silver plate for Seminole Red, an American hybrid. Mr. Kermit L. Warnasch, 4018 Drummond—Wagner tray for Sweepstakes Award. Mr. Kermit L. Warnasch, 4018 Drummond—Silver shell for best Dutch Seedling he hybridized, plus Preliminary Commendation from American Plant Life Society. Mr. John Ellett, 7531 Satsuma—Silver plate for best in Invitational Class—Queen Superiora.

Fig. 5. Greater Houston Amaryllis Show, 1967. Mr. Kermit L. Warnasch, winner of Ludwig Challenge Cup with 'Royal Dutch' along with Award of Merit.

Mrs. Clint R. Black, winner of silver trophy for 'Sparkling Gem', a miniature along with Award of Merit.

Mrs. R. H. Haase was Staging Chairman, and was assisted by Mrs. Glen Melton. Their interpretation of the theme added a whimsical note to the show. The focal point was a large tree decorated with white birds, while the busy bees and colorful butterflies perched on the amaryllis blossoms in the garden in the center of the auditorium.

Mrs. Chas. H. Pease prepared the Educational Exhibit which was a very popular part of the show. She had containers on the table, each with the correct portions of ingredients to make a good loamy soil for planting the seeds. She explained they were heavy feeders and as soon as they were established in the pot to feed at regular intervals. Other containers, to which the seedlings had been transferred at various stages of growth showed the progress through approximately two to three years growth, when they were developed sufficiently to produce a bloom, adding that some seedlings bloom as early as eighteen months, while others take longer. On the table was a specimen of a cross between a Dutch and a Mead, which the public could evaluate for beauty of the Dutch parent and sturdiness of the American parent. She also had a pure Dutch seedling as well as a species and a Miniature. All in all, the public was quite interested in producing some of these glamorous blossoms from seed and asked many pertinent questions.

Mrs. Sally Fox and Mrs. J. F. Denison, in charge of Entries, felt that it is very evident that members are striving for something new in amaryllis, as the register revealed there were 12 Dutch seedlings and 3 American seedlings competing for the silver trophy and Preliminary Commendation from the American Plant Life Society. Also, visitors were able to see amaryllis grown commercially in Africa and India in this show. Incidentally, the seedlings received unusually high grades from the judges, with the winner, Mr. Warnasch getting 97 points for his very large pink blend seedling. The second highest score of 96 was given to the darkest black-red blossom any of us have seen, which was hybridized by Mrs. R. A. Fawcett, who was awarded a Preliminary Commendation certificate.

Arrangements, showing the effectiveness of amaryllis, made by the members, were placed on pedestals on each side of the stage. These were not judged and merely added beauty to the show.

Mrs. W. S. Wheeler, 4506 Bellaire Blvd., is President of the Club, and assisted the Show Chairman, Mrs. Clint R. Black.

The members felt they gained many new amaryllis fans who will add these bold, colorful blossoms to their gardens. Our Invitational Class held twice as many specimens this year which is an indication that last year's show was successful in getting some new growers who wanted to compete for the silver trophy.

OFFICIAL HATTIESBURG AMARYLLIS SHOW, 1967

MRS. SAM FORBERT, *1910 Evergreen Lane, Hattiesburg, Miss. 39401*

The Hattiesburg Amaryllis Society held its seventh Annual Show April 22, 1967 in the beautiful and spacious home of Mrs. Lloyd Bond on Memorial Drive. The show which was open to the public from 3 p.m. to 8 p.m. attracted several hundred Amaryllis fans.

The exhibit was in the form of a Placement Show, the first of its kind for our Society. This type show, which is used extensively by garden clubs, proved most successful, as it afforded visitors to the show an opportunity to note the adaptability of the Amaryllis to the interior decor as well as to the garden. Near the entrance to the Bond home was a miniature cornice with draped curtains announcing the theme of the show, Curtain Call For Amaryllis. Both potted and cut scapes of many varieties of amaryllis were exhibited in the carport and on the patio. Blooms were classed according to division instead of country of origin as done in previous shows.

Seedlings exhibited were of the finest quality and won many Preliminary Commendations. The Amaryllis judged best in the show was a seedling grown by Mrs. Gladys Coursey of Moss, Mississippi, a Member of the Society. Mrs. Leonard T. Brown was Sweepstakes Award winner with twenty three blue ribbons. Three Award of Merit Certificates were placed on her 'Red Coral', 'Flora Queen' and 'Picotee Red Lining'.

Mrs. Brown also won the Swetman silver tray, a Traveling Trophy, awarded by Swetmans' Amaryllis Nursery of Gautier, Mississippi. Door prizes were Dutch bulbs donated by Mr. Robert D. Goedert, bulb dealer of Jacksonville, Florida. Throughout the home there were many competitive artistic designs made by members of the Society. Each room had a theme, in keeping with the general show theme. Magnificent Obsession was the theme in the foyer. Mrs. Sam Forbert made the design here which won the Tri-Color Award. Mrs. J. O. Mayo won the Creativity Award. This design in the den of the home had as its theme, South Pacific.

Punch and cookies were served on the patio during the afternoon and evening.

Judges for the Horticulture Division of the show were: Dewey W. Hardy, Mr. & Mrs. Jeff Brown and Mrs. H. A. Allen of Mobile, Mrs. Mittie Young, Wilma H. Smith and Betty Hardy of Chickasaw, Alabama. Artistic Designs Judges were Mesdames Curtis Knight, Tom Mayfield and S. K. Ward of Taylorsville, Mississippi. Show Chairmen were Mrs. Charlie Bell and Mrs. R. A. Fowler.

1967 OFFICIAL CORPUS CHRISTI AMARYLLIS SHOW

MRS. CARL C. HENNY, *Vice-President*
P. O. Box 3054, Corpus Christi, Texas 78404

The Coastal Bend Amaryllis Society held it's annual Amaryllis Exhibit in conjunction with the Lola Forrester Flower show which was held in the Exposition Hall on April 15th and 16th, 1967. We are pleased to report that our weather conditions were much milder this year but rain is needed very badly in this area of Texas. However we were fortunate in having 67 entries of Amaryllis, mostly cut scapes, as our potted plants had bloomed ahead of time. In fact we had only four Pot Grown Registered Leopoldii Type Amaryllis in the Exhibit—namely, 'The Alamo', 'Indian Orange', 'American Express' and 'Picotee'.

Among the Registered garden grown Leopoldii Type Amaryllis were: (cut scapes) :—'American Express', 'Apple Blossom', 'Beautiful Lady', 'Cardinal', 'Daintiness', 'Goliath', 'Ludwig's Dazzler', 'Margaret Rose', 'Royal Dutch', 'Peppermint', 'Picotee Square Dance', and 'Spring Dream'. Among the Miniature Gracilis type were: 'Constant Comment' and 'Firefly'.

Mrs. Levi Materne received a blue ribbon on her entry of Picotee, pot grown, which scored 96 points. She was also given an American Plant Life Society Award of Merit for this specimen, and received a Preliminary Commendation Award on her entry of *Amaryllis belladonna* which scored 95 points. Mrs. Materne is a club member.

Mrs. Carl Henny received the "Ludwig Challenge Cup" for her entry of "garden grown" Leopoldii "Picotee Square Dance" cut scape which scored 95 points—a blue ribbon winner; and received a blue ribbon also on her 'Spring Dream' garden grown registered cut scape, which gave her the most blue ribbons in this section of the exhibit. Mrs. Henny also received the American Plant Life Society Award of Merit for her 'Picotee Square Dance' entry. Mrs. Henny is a club member.

Fig. 6. Corpus Christi Amaryllis Show, 1967. Mrs Carl C. Henny, winner of Ludwig Challenge Cup for her garden grown Leopoldii "Picotee Square Dance" cut scape which scored 95 points.

Mrs. Charles W. Sanders, a non-member, received the Award of Merit for the most outstanding entry within the Amaryllis Section, which was 'Apple Blossom', scoring 97 points; also a Special Trophy given by our Amaryllis Society to a non-member who receives the most blue ribbons in the registered and named amaryllis classes. She also received the American Plant Life Society Award of Merit for her cutscape—'Apple Blossom'.

Mr. Fred B. Jones, club member, received the American Plant Life Society Preliminary Commendation Award for his cut-scape entry in the Breeder's Class Seedling, which scored 95 points.

Thirty blue ribbons were awarded specimens entered. Three Accredited National Amaryllis Judges from San Antonio,—Mrs. E. T. Storey, Mrs. Robert E. Herold, and Mrs. R. H. Parkinson, judged our Exhibit.

1967 SOUTHERN CALIFORNIA OFFICIAL AMARYLLIS SHOW

V. ROGER FESMIRE, *Show Chairman*

The third Amaryllis Show of the Southern California Hemerocallis and Amaryllis Society was held on May 22 and 23, 1967, at the Los Angeles State and County Arboretum, 301 N. Baldwin Ave., Arcadia, California. The most remarkable aspect of this show was the fact that we even had one, since the majority of our Amaryllis are grown outside. After an unusually cold spring, the week preceding the show was filled with wind, rain, hail, and cloudiness. The show was convincing proof that Amaryllis flowers can weather the storms and still look presentable.

Fig. 7. Southern California Amaryllis Show, 1967. A portion of the exhibits. Photo by Margie Sellers.

The Cecil Houdyshel Memorial Trophy, which is the sweepstake prize, was won by Mr. W. Quinn Buck of Arcadia, with the runner-up being Mrs. Flores Foster of Long Beach. Many hundreds of visitors viewed the exhibits during the two days, and by an overwhelming majority selected as the most outstanding exhibit a beautiful double Amaryllis raised from seed by Mr. J. Leonard Doran of Burbank. This was a pure white flower edged and spotted lightly with crimson, and it was the highlight of the show without any question, receiving the President's Award. An American Amaryllis Society Award of Merit was given to a hugh plant of 'Piccardy', having four magnificent blooms, which was grown by Mr. W. Quinn Buck in his greenhouse.

A table of miniature Amaryllis attracted much attention, making it apparent that the public is beginning to appreciate the smaller-flowered Amaryllis. One well-known nurseryman remarked that this table was "the dessert" of the show. One particularly beautiful plant in this miniature section was a hybrid between 'Tangerine' and *A. striata fulgida,* having a perfect Leopoldii type flower with a ruffled edge; it was raised from seed by Mrs. Bert Williams of South San Gabriel. Another table attracting much interest was an educational exhibit, showing how to cross pollinate the flowers and raise Amaryllis from seed.

Special Awards were given to Mrs. Bert Williams, Mr. Walter Horsey, and Mr. John A Moromarco for the large quantity of cut specimens which each entered in the show, thus contributing materially to its success. A Special Award was also given to Mr. E. A. Angell, who was a show visitor and exhibitor, in recognition of his more than thirty years of Amaryllis breeding in Southern California. Special mention should also be made of one of our members, Mrs. Eleanor McCown, who came more than 200 miles to enter her exhibits. Among her other entries, she prepared and entered three arrangements of Amaryllis, all of which received ribbons.

A Special Award was also given to the Chadwick Gardens of Redondo Beach for their non-competitive exhibits. In addition to some superb cut specimens and potted plants, they entered eight beautiful arrangements, demonstrating how Amaryllis blooms can be used by the florist in every type of floral design work. The bouquets to be carried by a bride and her attendants attracted particular attention. Our Society wishes to publicly express its appreciation to the Chadwicks for helping each year to make the show a success.

HOUSTON AMARYLLIS SOCIETY—HOUSTON, TEXAS

Mrs. A. C. Pickard

Nine years have now rolled into history since the day the Houston Amaryllis Society was organized. Yet, today there is greater enthusiasm, rapture and there are thrills without bounds as new hybrids are grown in the garden.

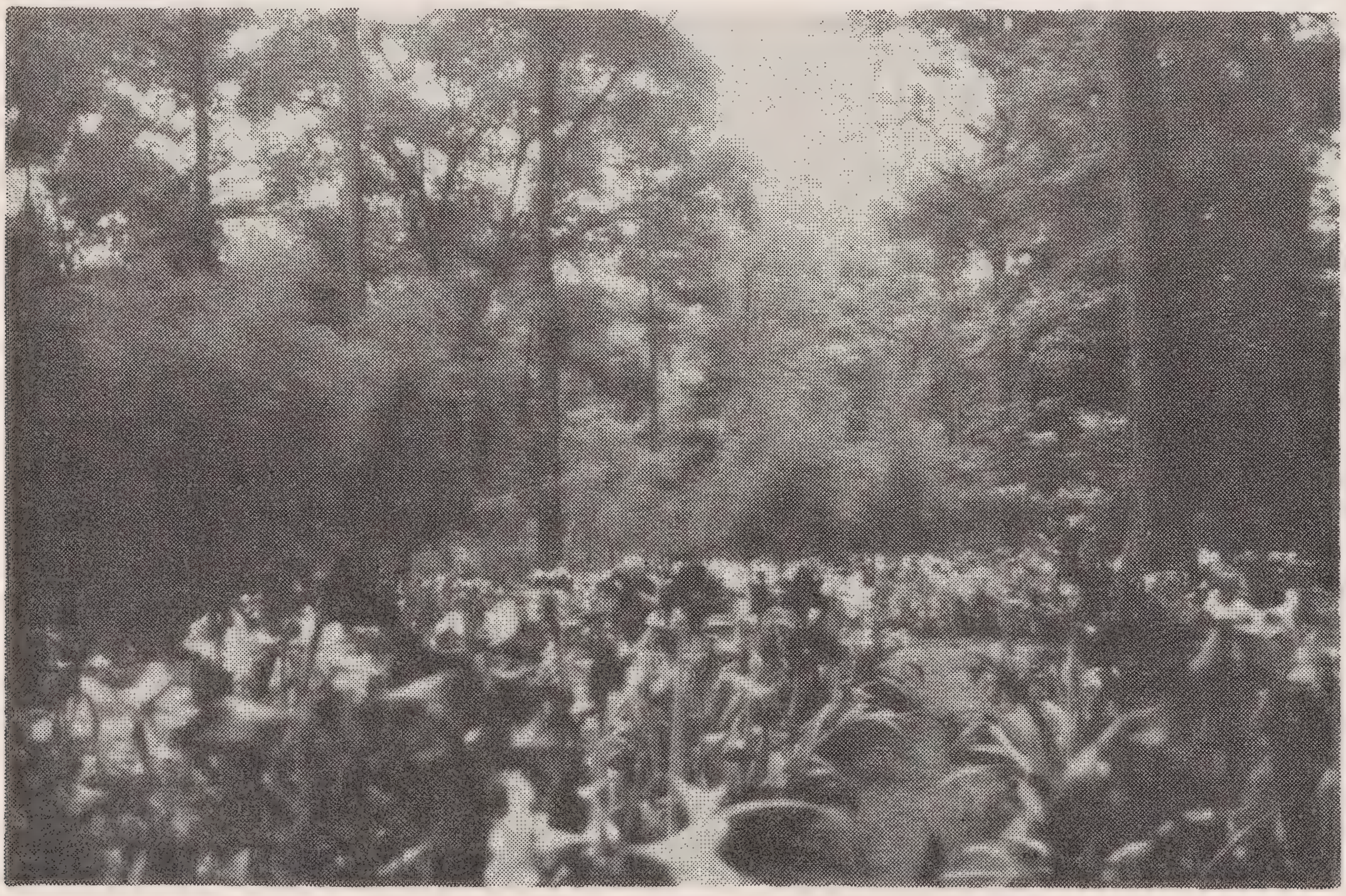

Fig. 8. Country garden of Dr. E. M. Yeats, Member of Houston Amaryllis Society, showing view of part of a thousand plants in bloom, 1967.

Every tint, shade and tone is reflected in modern day hybrids and every blend has a charm of its own to bring joy and excitement wherever the Amaryllis is known.

The gardens reached their peak much too early for the scheduled date of the official show. The membership felt we would not lower our standards by staging blooms that were not exhibition quality. However, nice cultivars won high honors in some few local flower shows.

Individual gardens of members were opened with many fine specimens. By re-visiting the gardens, we were able to see many prime blooms that were not open on previous visits. Amaryllis enthusiasts and garden lovers came to study and admire the colorful flowers and extensive experimenting under way.

So many fine Dutch Amaryllis seedlings of first quality bloomed this spring that it is difficult to select those which are worthy of being introduced. Some of the gardens contained many of the older Dutch hybrids still as lovely as when they were planted more than twenty years ago.

The most important feature was the effort to encourage the *garden growing* of Amaryllis and to increase garden programs as well as garden judging. The effectiveness and value of growing quality Amaryllis in this manner also helps to raise the floricultural standards of the community.

A bird's eye view of the country garden of one Houston Amaryllis Society member, Dr. E. M. Yeats, boasts of more than one thousand blooms and in a small corner of the city garden of Mrs. A. C. Pickard, several hundred fat buds nestled in deep shining foliage, soon to put on a show all their own.

We hope many of you will plan to be our guests in the coming years when we again try to reach the peak of perfection with a wealth of material to choose from. These beautiful blossoms seem to whisper, "God's presence is near".

BASIC INFORMATION FOR THE AMARYLLIS SHOW SCHEDULE

MRS. A. C. PICKARD,
Official Amaryllis Judging Instructor

It is appropriate to outline a pattern of organization and method of procedure that may be helpful to all local committees in conducting Amaryllis Shows in the future. The actual schedule should have the approval of the American Amaryllis Society itself and should not be changed from year to year in any way except as certain features related to the local situation might be added or deleted.

The following material is meant to be suggestive of most of the details to which show officials and exhibitors must give attention.

CULTURAL PERFECTION, CONDITION, GROOMING AND SUITABLE CONTAINERS

The beauty of horticulture should depend upon cultural perfection and natural appearance at the time of judging. Foliage, if present, should be clean and fresh, but not artificially polished. Spent florets and scapes should have been carefully removed. Any necessary staking should be done as inconspicuously as possible and related in color. No stakes should protrude above the florets.

Containers may be either clay pots or wooden planters, although clay pots are preferred in relation to the good culture of the plant. Clashing colors, such as brilliant glazed pots, shiny foil, etc. detract from the plants' color and should be eliminated. The light reflection of shiny, unsuitable material is also a great hindrance in photography Cultural malpractice is often concealed in a covered pot and reflected in a plant's appearance. Suitable, clean containers are allowed 10-15% of the cultural perfection points.

The size of containers should be proportioned to plant size and should not look overpotted so as to seem lost in the container.

Containers for cut specimens should be provided by Flower Show Committee and be of uniform size.

Artistic Divisions Classes, although not compulsory, add to the appearance of the show. The situation will vary greatly from place to place. Remember—the judging of these classes requires a different panel of judges.

EDITOR'S MAIL BAG

The new address of Sydney Percy-Lancaster as of January 1, 1967, is *Indian Botanic Garden, P. O. Botanic Garden, Sibpur, Howrah, near Calcutta, India.* He writes, "I had already spent 61 years there before I went to the National Botanic Garden Lucknow, so will be among old friends."

Dr. W. W. Zorbach, formerly of Kensington, Maryland, writes under date of July 25, 1967, "I dug up all my bulbs in June and packed them in vermiculite; they were shipped with our furniture and arrived intact. I have been struggling with a suitable bed for them, but have been hampered lately by heavy rains, so they are not planted yet. Hopefully, in about a week I can get to the job before they expend *all* their energy in growth. . . . My new address is *4109 Walnut Drive, New Iberia, Louisiana 70560.*"

The January 11, 1967 issue of Farmer's Weekly, Bloemfontein, South Africa, features a color plate of Mr. Leon Boshoff-Mostert's new Hybrid *Amaryllis* clone which he plans to use in his breeding operations. The issue also contains a tribute to Mr. Boshoff-Mostert on receiving the Herbert Medal, and an article about his hybrid *Amaryllis* which is profusely illustrated in color. The same issue also includes a color plate of *Haemanthus brevifolius* (=*Haemanthus carneus* (Ker.-Gawl.) Salisb.), and *Cyrtanthus sanguineus.*

AMARYLLIS JUDGES CERTIFICATES

Since the last report in the 1967 Amaryllis Year Book (pages 31 and 32), the following numbered Amaryllis Judges Certificates have been issued by the American Amaryllis Society:

167. Mr. E. M. Yeats, 7911 Baltimore Av., Houston, Tex. 77012 (Horticulture only)

168. Mr. V. Roger Fesmire, 16938 Elgar Av., Terrance, Calif. 90504 (Horticulture only)

169. Mrs. Kenneth B. (Polly) Anderson, 4810 Palm Drive, La Canada, Calif. 91011 (Horticulture only)

CATALOGS RECEIVED

KLEINSKUUR, 1966-67, 28-PAGE CATALOG, with 4 color plates, and other illustrations, featuring Hybrid **Amaryllis, Hemerocallis,** Tall Bearded **Iris,** and other **Iris;** and some miscellaneous plants and bulbs. Address: Leon & Frieda Boshoff-Mostert, Kleinskuur, P. O. Box 84, Balfour, Transvaal, Republic of South Africa.

UNIVERSITY HILLS NURSERY, 1967-68 SEASON CATALOG, Claude W. Davis, Proprietor, 470 Delgado Drive, Baton Rouge, Louisiana 70808, 23 pages listing **Amaryllis, Iris, Hemerocallis,** Crinums, Crinodonnas, **Zephyranthes, Kniphofia,** native trees and shrubs. Future catalogs will be ready for distribution about August 1 of each year, but will no longer be sent to the permanent mailing list. A free copy will be sent on request.

HYBRID AMARYLLIS CATALOG, Aug 1967. Robert D. Goedert, P. O. Box 6534, Jacksonville, Fla. 32205. (A) Dutch Strain Amaryllis seed; special crosses; (B) South African grown Hybrid Amaryllis; (C) Dutch Grown Hybrid Amaryllis—Van Meeuwen Strain; and (D) Imported Dutch grown hybrid Amaryllis—Super-Brand.

LUDWIG AMARYLLIS (17th EDITION), Ludwig & Co. N.V., P. O. Box 18, Hillegom, Holland. (received August 21, 1967); 32 pages and cover, profusely illustrated in color; listing the current offerings of hybrid named registered Amaryllis clones, and **Cyrtanthus purpureus** (syn.- **Vallota speciosa**).

AMARYLLIS LECTURES & JUDGES CERTIFICATE SCHOOLS

Local Amaryllis Clubs and Societies interested in having lectures on Amaryllis Culture, and schools for the Amaryllis Judges Certificate, should communicate with Mrs. A. C. Pickard, 1702 North Blvd., Houston, Texas 77006.

PLANT LIFE LIBRARY—continued from page 20.

ADVANCES IN MORPHOGENESIS, Vol. 6, edited by M. Abercrombie and Jean Brachet. Academic Press, 111 5th Av., New York, N. Y. 10003. 1967. Pp. 331. Illus. $15.00. This 6th volume in the series contains papers by seven outstanding authorities, including the biology of teratomas; the development of patterns in the integument of insects; the control of embryonic hemoglobin synthesis; heteroblastic development in vascular plants; ultrastructure of the nucleus of the developing amphibian egg; artificial parthenogenesis; polyploidy; gynogenesis and androgenesis in silkworms; and developments in sexual organogenesis. Highly recommended.

PHAGE AND THE ORIGINS OF MOLECULAR BIOLOGY, edited by John Cairns, G. S. Stent and J. D. Watson. Cold Spring Harbor Laboratory of Quantative Biology, Cold Spring Harbor, L. I., New York 11724. 1966. Pp. 340. Illus. $12.50. This stimulating book is concerned with the history of creative thinking and practice as exemplified in the recent development of molecular biology. After a delightful preface on the origins of molecular biology, the papers are grouped under (a) the phage renaissance; (b) phage genetics; (c) bacterial genetics; (d) DNA, and (e) ramifications of molecular biology. This is required reading for all biologists. Highly recommended.

PLANT PHYSIOLOGY, by Henrik Lundegardh, transl. by F. M. Irvine and W. O. James. American Elsevier Publ. Co., 52 Vanderbilt Av., New York, N. Y. 10017. 1966. Pp. 549. Illus. $37.50. This stimulating book incorporates the matured views of Prof. Lundegardh. The ten chapters deal with the cell and protoplasm; development of the cell; photosynthesis and the formation of carbohydrates; respiration; fermentation, and enzyme chemistry; plant nutrition; water balance; and plant growth and mocement. Highly recommended.

ROCKY MOUNTAIN FLORA, 3rd Edition, by William A. Weber. University of Colorado Press, Regent Hall, Boulder, Colo. 80304. 1967. Pp. 437. Illus. $9.40. This book specifically covers the central Colorado region, but it may be used throughout Wyoming, Colorado, and New Mexico, to good advantage because of a general similarity of the floras of the three states. Over 1,500 kinds of plants are keyed and classified, and there are 340 illustrations. The keys have been tested over a period of years, and the plant families are arranged alphabetically for the convenience of the non-professional users. Highly recommended.

PHYLOGENY AND FORM IN THE PLANT KINGDOM, by Howard J. Dittmer. D. Van Nostrand Co., 120 Alexander St., Princeton, N. J. 1964. Pp. xiii; 642. Illus. This book provides a survey of the Plant Kingdom with special reference to the descriptions of the structure, reproductive processes and phylogenetic relationships of the principal plant groups—bacteria, algae, higher green plants and fungi. The text is adequately illustrated, and the subject matter is sufficient for a full year's course. This attractive text is highly recommended.

CHEMOTAXONOMIE DER PFLANZEN, VOL. 4. DICOTYLENONEAE: DAPHNIPHYLLACEAE—LYTHRACEAE, by R. Hegnauer. Birkhaeuser Verlag, 4000 Basel 10, Switzerland. 1966. Pp. 551. Illus. sFr. 106. In the 1966 Plant Life, volume 3 of this series was reviewed, ending with Dicotyledones—*Cryillaceae.* In volume 4, the chemical compounds reported for the families *Daphniphyllaceae* to *Lythraceae,* are listed and discussed. The addenda and an index complete the volume. This valuable reference work belongs in the library of every taxonomist.

GERMANIUM, by V. I. Davydov, P. Rudenko and L. V. Kovtun. Transl. by Adam Peiperl. Gordon & Breach, Publ., 150 5th Av., New York, N. Y. 10011. 1967. Pp. 316. Illus. $18.00. After detailing the importance and uses of germanium in technology, the authors consider the raw material sources and methods of production of germanium, and the physiochemical properties of germanium and its compounds. The radioactive isotopes of germanium are discussed in an addendum. Highly recommended.

PLANT LIFE LIBRARY—continued on page 62.

2. LINEAGICS

[BIOEVOLUTION, DESCRIPTION, DETERMINING RELATIONSHIPS, GROUPING INTO LINEAGES]

NOTES ON **AMARYLLIS** SPECIES 1967

JOSEPH C. SMITH, *M. D.*
8939 La Mesa Blvd., La Mesa, Calif. 92041

Everyone loves a surprise and that is just what you are in for when you are growing a new species of *Amaryllis* for the first time. Thanks to our good friend D. C. G. Ruppel of Mendoza, Argentina, who supplied the bulbs, I have once again had this very pleasant experience.

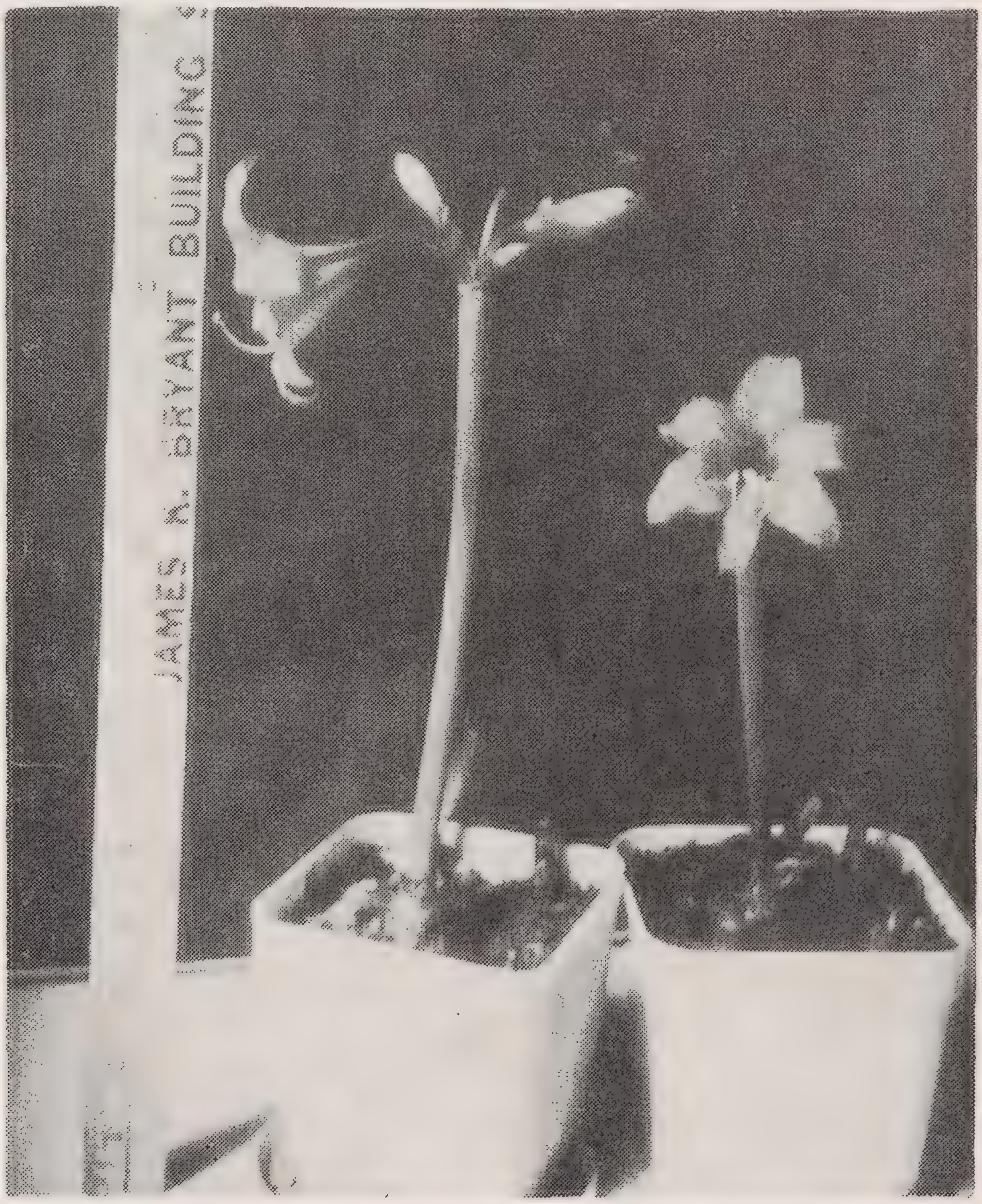

Fig. 9. **Amaryllis** sp. "Red Cochuna", collected by Dr. C. G. Ruppel on the Cochuna River near Conception, Argentina, October 1966.

In October of 1966 Dr. Ruppel sent bulbs of what he thought might be a new species of *Amaryllis* that he had collected on the Cochuna river near Conception, Argentina. The temporary name of this species is "Red Cochuna". When these bulbs were planted they quickly sent up slender flower scapes that bore two to four flowers of an orange red color similar to that seen in some of the deeper toned striatas. The form of the flowers resembled that of *A. aglaiae* so much that my first thought was that this was possibly a red form of *A. aglaiae.* However, on closer observation of the stigma it was easy to see that "Red Cochuna" (Fig. 9) belongs with the subgenus *Lais* and is therefore separated from *A. aglaiae.* The foliage also closely resembles that of *A. aglaiae* by being about an inch in width for most of its length and by having an obtuse, rounded tip. The bulbs are different; being more globose. None of the species has such beautifully shaped bulbs as *A. aglaiae* with its perfect oval shape.

The new species, "Red Cochuna", blooms early in the season with or without foliage but with plenty of foliage on younger non-flowering bulbs in the same clump. A very distinctive characteristic of this species is its rapid growth in spring and early summer with complete flagging of its foliage in mid summer and reappearance in fall; lasting until cut down by winter. The flowers come with the early spring growth and do not repeat with the fall foliage. This characteristic distinguishes it from all other *Amaryllis* species known in this part of Argentina.

It is suggested, should this prove to be an entirely new species of *Amaryllis* that it be named for Dr. Ruppel who discovered it. However, Dr. Ruppel might do well to wait before having his name applied to a species until another of his discoveries can be identified. This one (see Fig. 11) is a beautiful brownish-red *aulica* type from Brazil. It has a green center and white petal margin and is pretty enough to do honor to anyone's name.

Dr. Ruppel has described so many interesting amaryllids which he has collected in his travels about South America that one can hardly keep from being greedy when requesting bulbs from him. To mention a few—there is the fertile form of *Amaryllis ambigua,* the greenish-yellow long-trumpeted fragrant species, the possible *A. petiolata* from Uruguay, and *A. parodii,* to say nothing about the many *Rhodophiala, Habranthus, Zephranthes,* etc., species he has collected.

It is certainly hoped that Dr. Ruppel will have many more years of good health in his now retired life so that he may continue his travels and collections of amaryllids. It is understood that certain groups in this country are contributing to the financial success of his collecting trips. He is certainly a man who knows amaryllids and is in a position to do much toward the advancement of knowledge of these most interesting plants. He deserves all our support.

THE RHODOPHIALAS ARE COMING!

Paul H. Williams, Jr., *6128 Sundown Drive,*
Fort Worth, Texas 76114

For several years I have been amazed that most of the known species of the family *Amaryllidaceae,* until very recently, were first discovered and described during the 18th and 19th centuries and relatively nothing in between. Consider the difficulties and expense involved during those periods as compared to our own times. And most of the species have to be rediscovered to be enjoyed by us! All that lost time to be made up! Without the original descriptions we wouldn't even know of the existence of large sections of the family. Are they really that rare in their native lands or is it that most people just don't care?

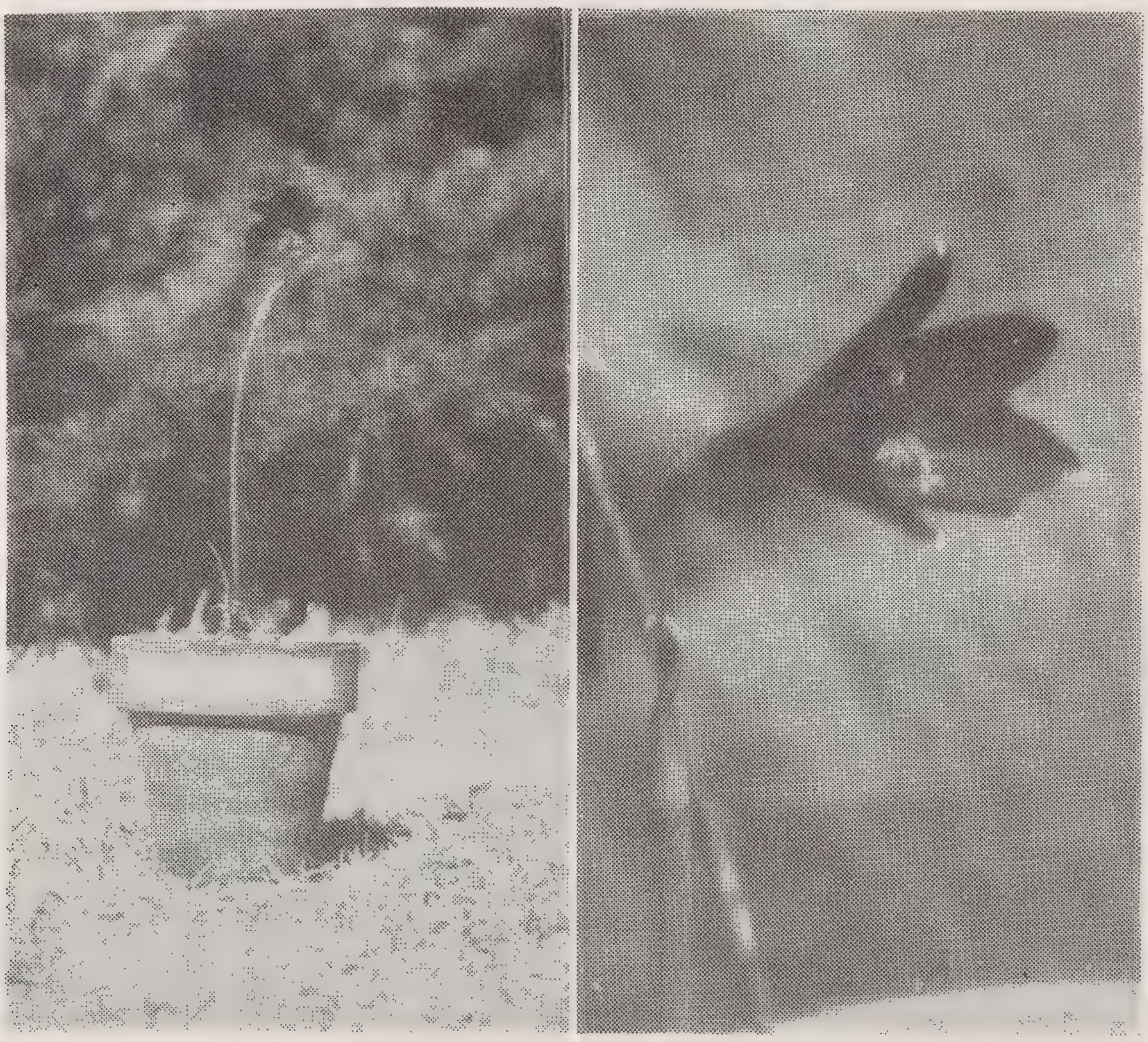

Fig. 10. Amaryllid imported as **Rhodophiala rosea: left,** potted plant photographed at 3 ft. by Paul H. Williams, Jr. at Fort Worth, Texas. Photo by Dr. C. G. Ruppel. **right,** the same from a color slide taken by Dr. C. G. Ruppel, Mendoza, Argentina.

My addiction to the family *Amaryllidaceae* became certain in the late 1950s and since that time I have done my best to make up for lost time and prior ignorance. For instance, in the Tribe *Zephyrantheae,* which, incidentally, seems to fit into the variable climates of Texas, there is the genus *Rhodophiala* which contains 31 species native to Chile, Bolivia, Argentina, and Uruguay. In Fort Worth you see the one called ''Ox-blood Lily''. Fairly common, thriving, and beautiful in the fall. Why not any others? I want to see all 31 of them! So I went to Argentina—by mail, of course! And there I found Santa Claus! He really exists! In the person of Dr. C. Gomez Ruppel. Thanks to the generous efforts of that worthy addict we now have, to my knowledge, in various stages of development, 14 species of *Rhodophiala.* Only one has bloomed so I will tell only about it.

During the first week of November 1966 I received a parcel of amaryllid bulbs from Dr. Ruppel. Among these treasures was a packet labeled ''A. bifida Sehnem'' which contained two marble sized, marble shaped bulbs and a litter of bulblets. The two bulbs were planted in a 4-inch bulb pan and watched for developments—and watched—and watched. In January 1967 curiosity overcame caution and one was eased out of the soil. No roots were evident but the ring of bulblets formed reminded one of a setting hen and chickens. Everything was carefully replaced.

One day in late January, a bud was spotted nosing out of one of the bulbs so water was immediately applied to help the delivery. During the time the scape was emerging, Dr. Ruppel's letter was referred to again for possible enlightenment. His description read: ''Father Aloysio Sehnem, a good friend and botanist from Sao Paulo, South Brazil, gave me this very nice bright red, miniature of the subgenus *Chilanthe.* Evergreen in Mendoza. Flowers in late spring. Rich black, fibrous soil.''

When the scape had reached a length of 16 cm., the single bud opened to a beautiful brilliant red. (Fig. 10) The bloom was selfed with crossed fingers, but it did no good. The ovary didn't even pretend to swell and a later letter from Dr. Ruppel confirmed what I had dreaded—it was self-sterile. In spite of this, it should become popular, as offsets form about as fast as those of *Nordoscordum inodorum.*

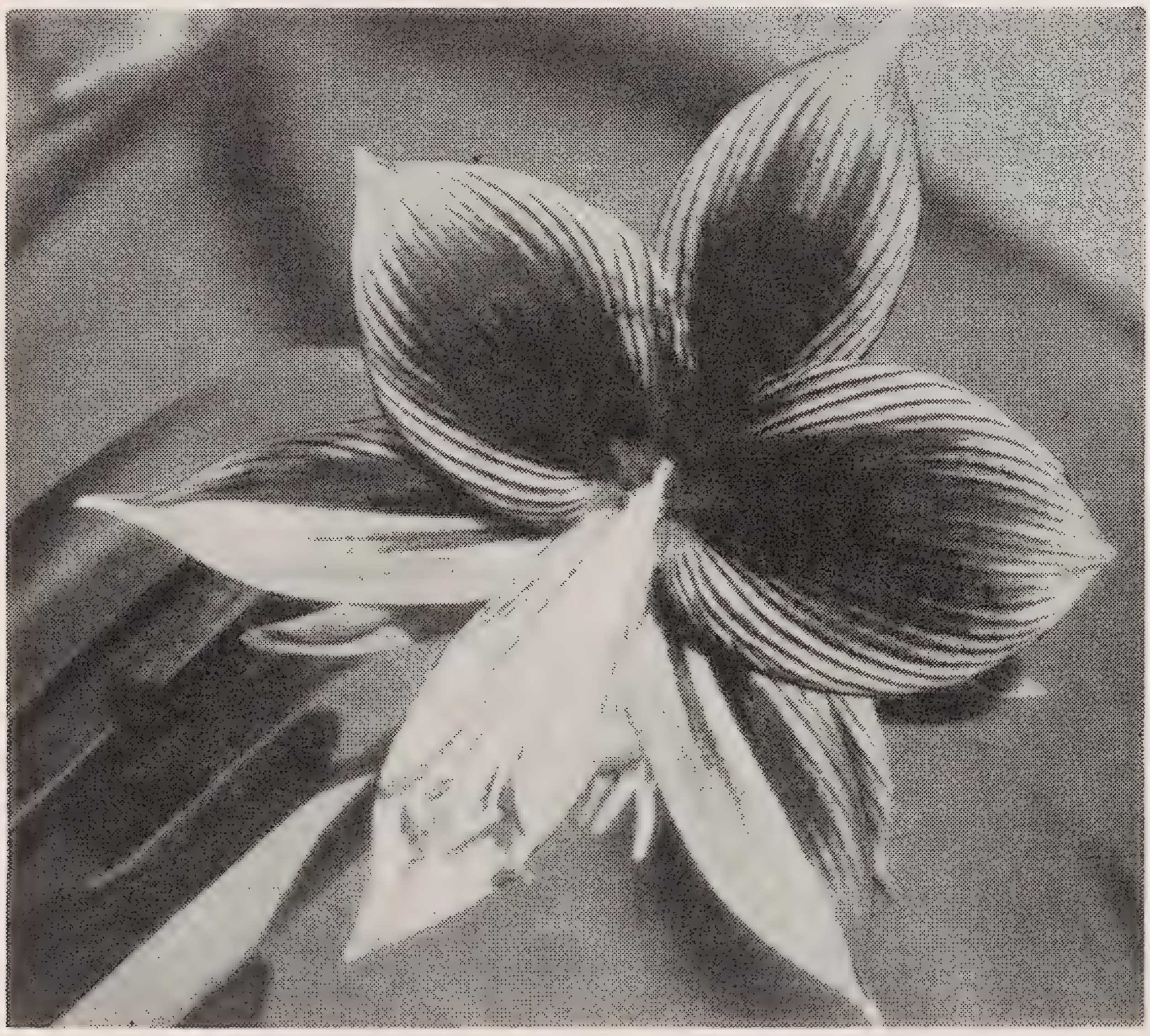

Fig. 11. Brownish-red **aulica** type **Amaryllis** discovered by Dr. C. G. Ruppel in Brasil. Photo by Dr. Ruppel.

Careful measurements were taken and the key to genus *Rhodophiala* in 1956 PLANT LIFE was consulted. Through the process of elimination, I arrived at *Rhodophiala rosea* (Sweet) Traub, which, in turn, led me to *Amaryllis barlowii* in AMARYLLIDACEAE: TRIBE AMARYLLEAE for the description. Yes, it checked! In my lay opinion we now have the long lost species first introduced in England in 1831 and now known as *Rhodophiala rosea.* A bulb has been forwarded to Dr. Traub for verification which should allow us to scratch off another member from the missing list.

Of the remaining 13 species of *Rhodophiala* in my possession some may bloom this year (1967) and will be reported on later, but most were received as seed and only time will tell.

Fig. 11 shows a beautiful brownish-red *aulica* type Amaryllis discovered by Dr. C. G. Ruppel in Brasil.

References: page 72, 1956 PLANT LIFE; page 122, HERBERTIA 1938; page 35, HERBERTIA 1934, and page 97, Amaryllidaceae: Tribe Amarylleae, 1949.

AMARYLLIS AULICA KER-GAWL.

SAM CALDWELL

The following is a report on SA 63-10 received from Robt. D. Goedert, Dec. 15, 1963 who imported the bulbs from South America. The bulb flowered in December 1966 when the fine flower scape in Fig. 12 was photographed. The species was identified by Dr. Hamilton P. Traub as *Amaryllis aulica* Ker-Gawl.

Dec. 15, 1963—4 very dry bulbs, ⅞″ to 1″ in diameter, pear-shaped without roots, all planted together in a 7″ azalea pot. Interim note: Bulbs grew strongly from the first. New leaves start in late summer or fall, grow through winter in cool greenhouse and tend to die away before hottest summer comes again. Foliage appearance and growth habits are so exactly like those of *A. aulica* var. *stenopetala* that I felt sure that is what it would turn out to be. Bulbs have remained for 3 years in the same pot with same soil, in perfect health and vigor, but they now completely fill the pot and are crowding each other.

Dec. 1, 1966—One bulb, now 2⅝″ in diameter, has a fine flowering scape (Fig. 12). Another bulb, 2 5/16″ in diameter, has a scape with buds nearly ready to open. A third bulb is considerably larger than these, with larger and longer leaves (3⅜″ bulb diameter) and may be different; it has never bloomed. The fourth bulb is smaller and has not bloomed, either.

Scape is 18″ tall; pedicels, 1⅞″. It has 2 flowers, each 6″ across, 6½″ top to bottom, and approximately 3¾″ deep. Upper inner segments 1¾″ wide; lower, outer segments ⅞″ wide. Stamens shorter than segments; pistil about as long as segments. Stigma split deeply in 3 parts. Segments are a strong red color with deeper red veining blending into a deeper reddish maroon shading toward the throat, though a part of the deeper appearance is due to a surface sheen that is quite attractive. Base of all segments is strong green, inside and out, giving the flower a distinctive green throat. Dec. 12, 1966—The second budded scape, mentioned above, has now bloomed. Though undoubtedly the same species, it is not absolutely identical to the first. Segments are not quite as wide. Basic coloring is the same, but the green throat is not as deep as in the first flowers; also, on each segment a narrow, irregular line of the red-maroon coloring near the base runs along the middle of the segment right through the green area, back to the very base.

I consider the second individual a little inferior to the first, though both are beautiful amaryllis, the distinctive red-and-green pattern giving a sort of "Christmasy" effect. This, apparently, is the normal blooming season for this species. Its vigor and health and ease of growth, together

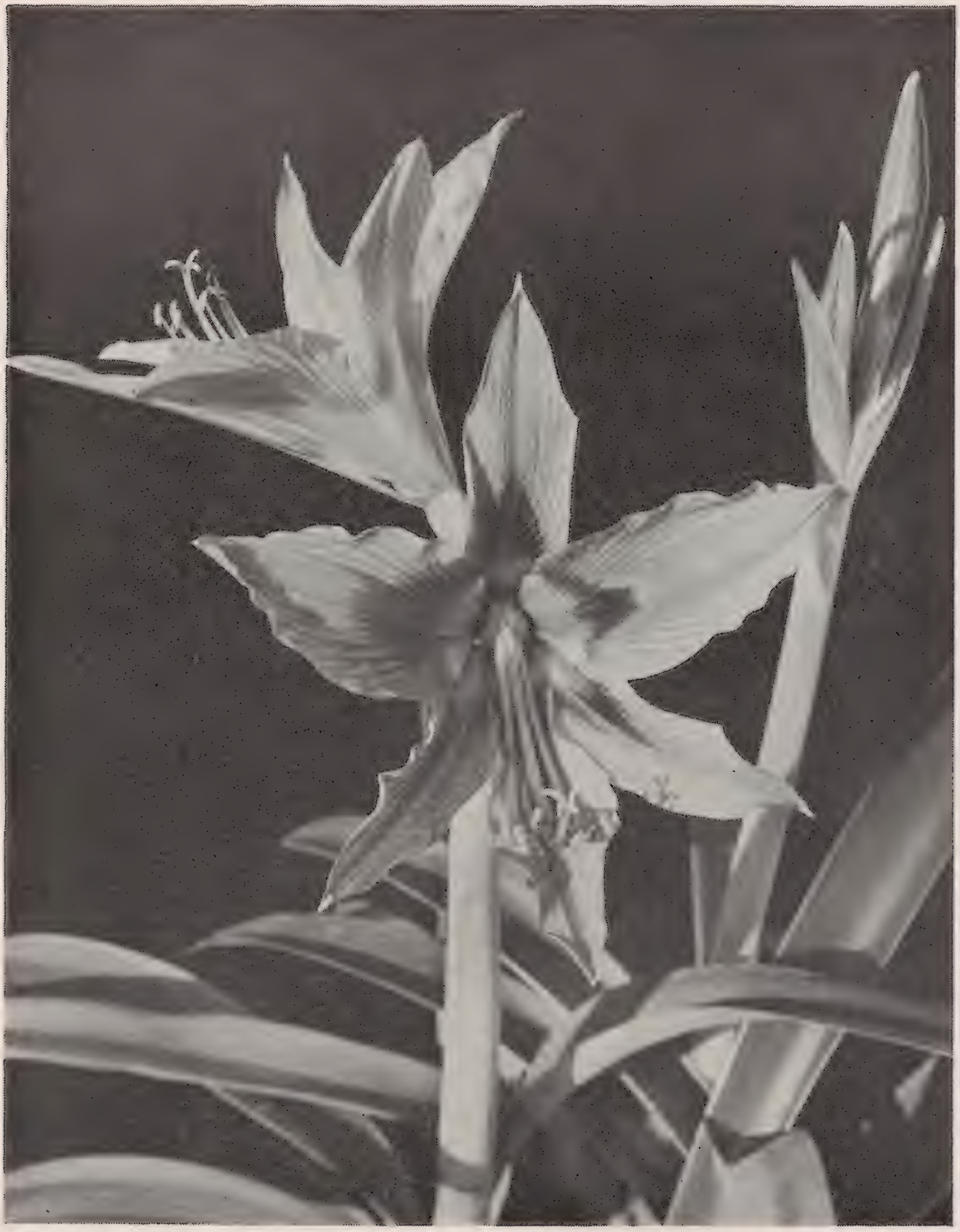

Fig. 12. **Amaryllis aulica** Ker-Gawl., imported by Mr. Robert D. Goedert (SA 63-10), from South America in 1966. Plant grown and photographed by Mr. Sam Caldwell, Nashville, Tenn.

with the attractive bloom, make it certainly one of the best of the unidentified species that I have flowered. I've marked the bulb with the better bloom and will try to build up a stock of it. Would this be simply the typical *A. aulica?* Later identified by Dr. Traub as *Amaryllis aulica* Ker-Gawl. with relatively wider tepalsegs.

CRINUM SCHMIDTII REGEL

L. S. Hannibal, *4008 Villa Court,*

Fair Oaks, Calif. 95628

During the past ten years the writer has picked up a number of *Crinum moorei* variants and hybrids. One outstanding white form passes under the name of 'Herald' or 'Drysdale White'. The identity became puzzling when it was found that a bulb from Saint Catherine Island off the coast of Brazil, and another from Adelaide, Australia

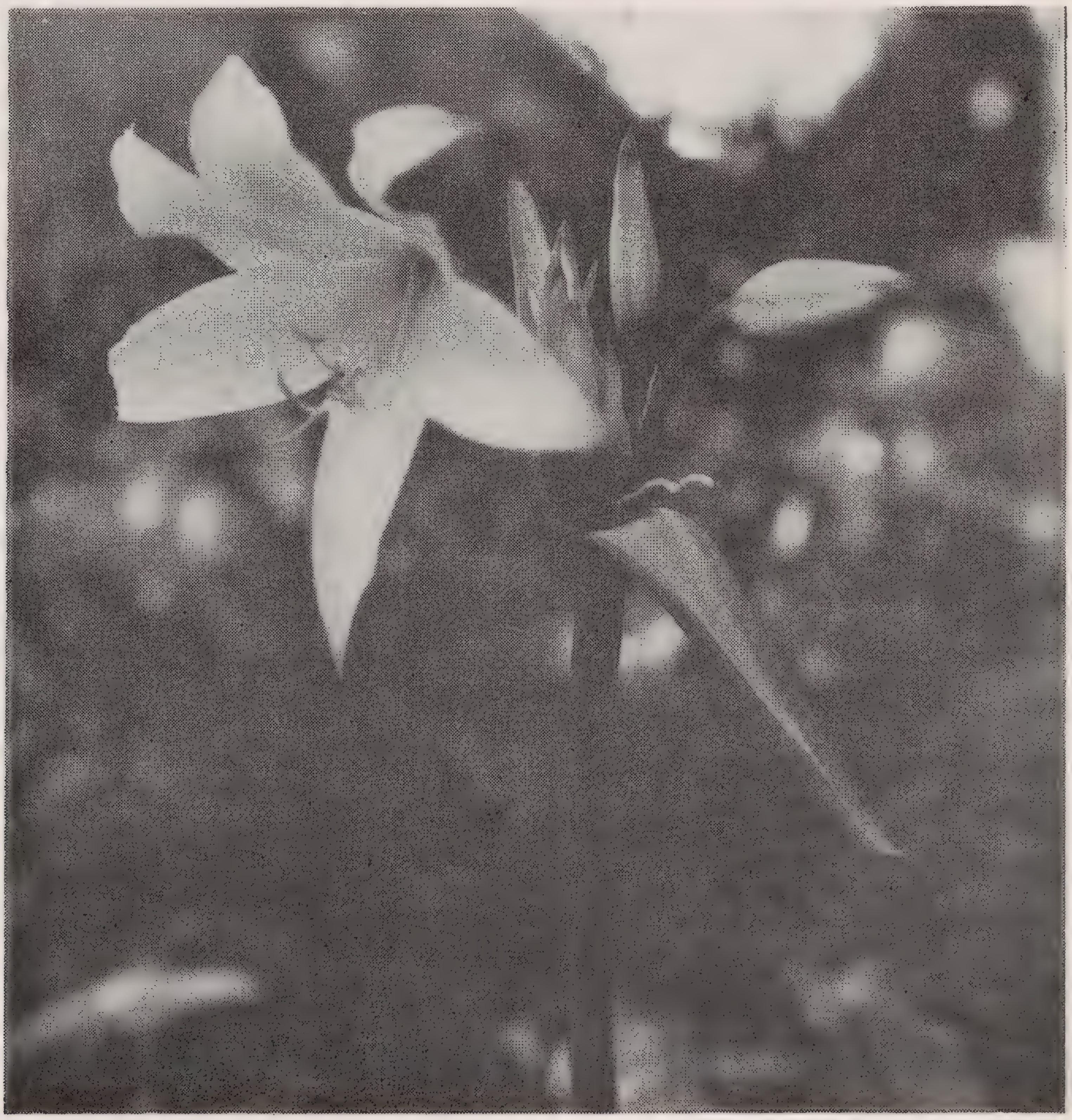

Fig. 13. **Crinum schmidtii** Regel as grown by Mr. L. S. Hannibal, Fair Oaks, Calif.

were similar. William Drysdale then reported that the bulb he was growing came from Mrs. E. M. Foster's garden, an early member of the American Amaryllis Society.

Two conditions were apparent, first that source of the bulb was undoubtedly from van Tubergen, and second that no hybrid would produce such uniformity in seedlings. Quite a search was instigated but *C. schmidtii* was excluded for some time since another *C. morrei* clone has been passing for *schmidtii* in California for more than 35 years. However, an examination of the Gartenflora description of *C. schmidtii* clarified the confusion. *Crinum schmidtii* Regel (syn.-*C. moorei* var. *schmidtii*) is significantly more robust than the common *C. moorei* with broader, sturdier foliage. The blossoms open widely and have a great deal more substance. These are snow white, no pigmentation is evident even in the filaments. The identifying factor is the bified stigmas with branches near 2 mm. long; a unique feature in *Crinum* and one of the causes justifying a separate species status.

It is to be noted that *C. schmidtii* is very slow growing, produces few offsets and does not seed freely. The bulb is better adapted to the humid Gulf climate than inland California. *C. powelli album* and 'White Stranger' are *C. schmidtii* seedlings which suggests it has good breeding characteristics.

AMARYLLID GENERA AND SPECIES

HAROLD N. MOLDENKE

[In this department the descriptions of amaryllid genera and species, particularly recent ones, translated from foreign languages, will be published from time to time so that these will be available to the readers.]

Allium Scaposum Benth, in Pl. Hartweg, 26. 1840. Leaves radical, linear-terete, long-sheathed at the base, shorter than the terete scape; spathe broad, bifid, shorter than the pedicels; umbel many-flowered, loose when capsule-bearing; perigonium [segments —omitted probably by error] lanceolate, acuminate, rather acute; stamens subequaling the perigonium; filaments subulate, dilated at the base. — Scape 12 or more inches long, slender; pedicels an inch long; perigonium segments 6 mm. long, white when dry, red-keeled in the center. Along small streams, Aguas Calientes.

Callithauma viridiflorum Herb. in Amaryll. 225. 1837. Bulb 6 inches long, cylindric; leaves about ¾ [inch] wide, green, almost flat; scape green, double; spathe marcescently deciduous; peduncles short, subequal; ovary oblong, trigonous, about ¾ inch [long]; [perianth-] tube 1¾ to 1⅞ inches [long], ¼ inch wide above, pale-green, the limb green, about an inch [long], the corona equal, paler, 12-lobed along the margin; filaments inserted in the upper region of the corona, connivet, included; anthers versatile; style shorter than the corona; stigma obtuse. C. angustifolium [has] the leaves half as wide, the [perianth-] limb surpassing the corona by ¼ inch, the style exceeding the perianth and the stigma dilated and 3-lobed.

REGISTRATION OF NEW AMARYLLID CLONES

Mr. W. D. Morton, Jr., *Emeritus Registrar*

Mr. James E. Mahan, *Registrar*

Mrs. Emma D. Menninger, *Associate Registrar*

This department has been included since 1934 to provide a place for the registration of names of cultivated *Amaryllis* and other amaryllids on an International basis. The procedure is in harmony with the International Code of Botanical Nomenclature (edition publ. 1961) and the International Code of Nomenclature for Cultivated Plants (edition publ. 1958). Catalogs of registered names, as well as unregistered validly published names, will be published from time to time as the need arises. The first one, "Descriptive Catalog of Hemerocallis Clones, 1893-1948" by Norton, Stuntz and Ballard was published in 1949. This may be obtained at $5.00 prepaid from: Dr. Thomas W. Whitaker, Executive Secy., The American Plant Life Society, Box 150, La Jolla, Calif. Catalog of Hybrid Nerine Clones, 1882-1958, by Emma D. Menninger; and Catalog of Brunsvigia Cultivars, 1837-1959, by Hamilton P. Traub and L. S. Hannibal, were published in 1960 Plant Life, with additions to both in Plant Life 1961. In Plant Life 1961, the first edition of The Genus X Crinodonna was published which serves also as a catalog of cultivars. In Plant Life 1964, the first edition, of "Catalog of Hybrid Amaryllis Cultivars, 1799 to Dec. 31, 1963" was published. Other catalogs of cultivated amaryllids are scheduled for publication in future issues.

The registration activity of the American Plant Life Society was recognized when at the XVIIth International Horticultural Congress in 1966 the Council of the International Society for Horticultural Science designated the American Plant Life Society as the Official International Registration Authority for *Amaryllidaceae* cultivars excepting *Narcissus* and *Hemerocallis.*

Only registered named clones of Amaryllis and other amaryllids are eligible for awards and honors of the American Amaryllis Society at Official Amaryllis Shows.

Correspondence regarding registration of all amaryllids such as *Amaryllis, Lycoris, Brunsvigia, Clivia, Crinum, Hymenocallis,* and so on should be addressed to Mr. James E. Mahan, Registrar, 3028 Palmyra St., New Orleans, Louisiana 70119. The registration fee is $2.00 for each clone to be registered. Make checks payable to American Plant Life Society.

REGISTRATION OF NEW AMARYLLID CLONES

Mr. W. D. Morton, Jr., *Emeritus Registrar*

Mr. James E. Mahan, *Registrar*

Mrs. Emma D. Menninger, *Associate Registrar*

Registered by Ludwig & Co., Hillegom, Holland

'Bellina' (Lud.-1967) R; A-856, D-5A; U-4 fld.; 22″-24″ h; fls. 9″-10″ diam.; Solid Porcelain Rose (RHS 620/1), slightly deeper shade in throat; spr.

'Courtesy' (Lud.-1967), R; A-857, D-5A; U-4 fld.; 22″-24″ h; fls. 8″-9″ diam; Apple green throat shading into white stripes contrasted with white Neyron Rose (RHS 623) changing into lighter rosy salmon and rosy salmon white towards ends of petals; spr.

'Eastern Dream' (Lud.-1967), R; A-858, D-5A; U-3 or 4 fld.; 26″-28″ h; fls. 8½″-9″ diam.; Carmine Rose (RHS 621/1); with darker throat (RHS 621); spr.

'Fairyland' (Lud.-1967), R; A-859; D-5A; U-4 fld.; 25″-27″ h; fls. 8″-9″ diam.; solid Neyron Rose (RHS 623), accentuated in throat.

'Fantastica' (Lud.-1967), R; A-860; D-5A; U-4 fld.; 22″-24″ h; fls. 9″-10″ diam.; Mandarin Red (RHS 17) with a white star springing from an apple green throat ending in white edge contouring each petal.

'Ludwig's Striped' (Lud.-1967), R; A-861; D-5A; U-4 fld.; 26″-28″ h; fls. 8″-10″ diam.; Poppy Red (RHS 16) edged in white similar to picotee red edging with distinct white line (abt. ½″) from throat fading toward tip of petal.

'Ludwig's Red' (Lud.-1967), R; A-862; D-5A; U-4 fld.; 22″-24″ h; fls. 7″-8″ diam.; Glossy Blood Red (RHS 820), darker throat, flowers perfectly round.

'Red Heron' (Lud.-1967), R; A-863; D-5A; U-4 fld.; 35″-40″ h; fls. 8″-9″ diam.; Capsicum Red (RHS 715) with darker throat.

'Carina' (Lud.-1967), R; A-864, D-8; U-4 to 5 fld.; 16″-18″ h; fls. 4″-5″ diam.; Mandarin Red (RHS 17/17/1); with darker throat with suggestion of green.

'Pretty Pal' (Lud.-1967), R; A-865; D-8; U-4 fld.; 24″-26″ h; fls. 4″-5″ diam.; Capsicum Red (RHS 715), with white striped throat.

'Rubina' (Lud.-1967), R; A-866; D-8; U-4 to 5 fld.; 16″-18″ h; fls. 4″ diam.; dark blood red with darker throat (RHS 820).

'Table Decoration' (Lud.-1967), R; A-867; D-8; U-4 to 5 fld.; 22″-24″ h; fls. 5″-6″ diam.; Mandarin red (RHS 17) with star in throat.

Registered by Mr. Alek Korsakoff, Jacksonville, Florida.

'Green Senorita' (Kors.1967), R; A-855; D-8; U-2 fld.; 55 cm. h; fls. 11 cm. diam.; Chartreuse green (RHS 66 3/1), pea green in throat; spr.-win.; semi-ev. Parentage: A. Striata x A. Evansiae.

Registered by Mr. Frederick B. Schmitz, Port Sulphur, Louisiana.

'Edward Authement' (Schm.-1967), R; A-868; D-7; U-3-4 fld.; 18″ h; fls. 6″ diam.; Cardinal red (RHS 822/1 to 822); spr.

SUGGESTIONS ON STAGING AMARYLLIS SHOWS

James E. Mahan

The keynote of any successful amaryllis show is advance planning, not only generalized planning but planning well in advance, down to the last and most minute detail. Any club contemplating staging an amaryllis show should appoint a forceful show chairman, one who has the ability to work with others and inspire them to get their jobs done with dispatch. The chairman should pick his co-chairman immediately so that he will have help with the many details that inevitably crop up. Next the various committees should be appointed, such as registration, classification, placement, publicity, judges, clerks, hospitality and dismantling.

The show date should be decided at the earliest possible moment. It should be set to coincide with the time that the amaryllis are at the height of their bloom. This can be difficult as many factors enter into this decision such as the weather throughout the winter and the ensuing early spring or a conflict with other shows previously announced. It can be seen that by announcing the date of the show as early as possible other garden clubs will respect such a choice and not schedule their shows on that date. In connection with the date, the place where the show will be held also has to be decided. Consideration should be given to the accessibility of the site chosen through public transportation and parking facilities for the visitors who come in their own automobiles. Next, the hours when the show will be open to the public should be decided and once these things have been resolved all the information should be given to the publicity committee so work can be begun on calling to the attention of the public that a show is going to be held. Of great help to the publicity committee are such media as newspapers (garden editors in particular), radio, transportation company bulletins, national gardening magazines (which demand that notices be sent months in advance in order to be published) and television stations. Do not overlook the television stations, especially when an educational station is located in your area. Usually they are more than willing to cooperate and perhaps you can even get your county agent to give you some help in arranging a presentation over a television station. Be sure to include in your publicity an announcement whether the show is open to competition by the public or is a closed show and whether there is any admission charge. The final duty of the publicity committee is the preparation of a report of the results of the judging in the show for publication by the newspapers along with pictures of the top prize winners.

A show schedule should be formulated by the show chairman as soon as possible and distributed to the club members and, in particular, to the various other committee members. A certain degree of latitude is allowed in setting up a schedule but care must be exercised that it meets all the requirements of an official show. In my estimation it is certainly easier and more convenient to set up a schedule according to whether registered and named or not and then subdivided into the nine divisions defined by the American Amaryllis Society rather than segregate the entires according to country of origin. It is becoming increasingly difficult to define what a ''Dutch'' hybrid is or what and ''American'' hybrid is and the former method obviates this difficulty.

Then, too, if using the latter classifications we run into the problem of what to do with the South African hybrids, or the Indian Hybrids, etc. Due thought should be given to the inclusion in the schedule of a special amateur breeder's competition in order to encourage hybridization and development by the local amateur grower.

Next in line will be arranging well in advance for the various trophies that will be awarded. Outside sponsors usually are willing to furnish some of the trophies with the club furnishing the balance that has been determined to be necessary. Arrange for the engraving, the ribbons, entry cards and programs so that when the morning of the show arrives everything is on hand at the site of the show. Entry cards can be given to all members before the show so that they can be filled out in advance thus speeding up operations on the morning entries are received. Have sufficient on hand for all anticipated entries from the public. Enough programs should be printed for each visitor to have one.

It will be necessary to make arrangements to have a sufficient number of accredited amaryllis judges on hand for judging the show. Contact them as soon as possible after the date of the show has been determined so that they can be engaged before making other commitments. The show chairman or someone he designates should meet with the judges on the morning of the show before the judging starts so that he can discuss with them the point scale to be used in judging, the number of points required for each ribbon awarded, and the higher trophies and awards that they are expected to determine. In setting the point scale care and good judgment should be exercised, taking into account the number of entries, the weather and any other factors so that when the scale is set the entrants will be encouraged and not discouraged; nevertheless, standards of excellence should not be compromised merely to allow a greater number of ribbons to be given out. It is a good idea to have someone familiar with judging meet with the judges for discussion of these points. If a member of your club is an accredited amaryllis judge, he would be an excellent choice for the assignment.

Clerks to assist the judges and to record their decisions must be chosen in advance and instructed in their duties and deportment during the judging. A short sheet of instructions to the clerks comes in very handy and can be issued to them weeks before the show so that they will know what is expected of them on the morning of the show. Before going onto the floor with the judges a short refresher talk by the show chairman or his designee should be addressed to the clerks.

The physical set-up of the show is a very important facet of any show. The placing of the tables on which the entries rest will be largely determined by space limitations but it should be done in a logical arrangement and yet not overlooking the aesthetic aspects. Tables can be arranged in a straight line or can be placed in a broken straight line with each individual table or groups of tables placed at an angle, say 45 degrees, for an effect that is very gratifying, making it seem that there are an even greater number of entries on the floor than are actually there. Space should be alloted to the various sections and divisions in accordance with the anticipated number of entries in each from past experience but be certain that it is flexible enough so that each can be expanded (or contracted) to accommodate an unforeseen increase (or decrease)in the number of entries. A loose or bad arrangement of the tables can detract from the effectiveness of the show and even cause embarrassment. A diagram of the physical set-up of the tables on the floor, showing the space alloted to each section and its subdivisions, is very helpful to the placement committee, in fact almost indispensable, Printed signs should be placed on the tables identifying each section and subdivision for the guidance of the placement committee and also for the public. Markers should be placed between subdivisions to clearly delineate the physical space limits of each. Identification markers, printed cards or such, should be furnished for named varieties and placed alongside of the group as an aid to identification to the viewer.

The flow of the entries on the morning that they are being accepted is extremely important in order to speed up operations and meet the deadline that has been set for judging to commence. A table or tables should be set up to register the entries by filling out the entry card, showing the name of the owner and the name of the plant. The plant is then taken to the classification section where the entry card is completed to show whether the plant is registered or not and to what Section and Division it belongs. In order to determine whether an entry is registered or not it is necessary to have on hand the 1964 Plant Life and succeeding issues which list all registrations to date. The entry is then transferred to the placement committee for removal to its place on the proper table on the floor for ultimate judging in its own section. Be careful that entries are not misplaced which could possibly cause judges to disqualify the entry. As a final precaution, before the judges come onto the floor, a check should be made by the show chairman and the classification committee to detect and correct any errors that may have been made in placement of the entry. This will avoid any embarrassment to all concerned. Once judging commences, no one but the judges and clerks are to be allowed on the floor. However, the show chairman should be on the scene to resolve any questions that may arise, if called upon to do so.

Containers for cut specimens must be furnished by the club sponsoring the show and should be uniform. Bottles have been used but are generally unsatisfactory. On the other hand, cans that are rather tall, such as those used for luncheon meats by grocers or institutions, can be had and sprayed on the outside with aluminum paint to present a very pleasing and uniform appearance. Covering each pot in which an entry is growing, with aluminum foil from the bottom to the upper rim will also present a uniform appearance when they are placed on the tables and at the same time mask any soiled spots or identifying marks present on the pot. The show chairman should make arrangements to have on hand at the registration desk a supply of aluminum foil in the event entries appear without the proper wrapping and also a supply of supports for the scapes if needed and wire "twistems" for use in tying. It is a good idea to make these things available to the entrant but he should be directed to make the necessary support of the scape himself.

In general the above remarks are directed to the horticulture section of the show. If arrangements featuring amaryllis are to be a part of the show, invitations to garden clubs or groups must be issued in ample time for them to accept and notify the show chairman of their acceptance. A theme is agreed upon and appropriate pedestals and/or niches with the proper background must be supplied for these arrangements. Judges qualified to judge arrangements must be present to take care of that part of the judging. It is certainly a nice gesture on the part of the club sponsoring a show to furnish refreshments for the judges before they start their chores and some token of appreciation to be taken home with them is always in order.

As set forth in the opening remarks any successful show is dependent on advance planning but chances are that no matter how many pains are taken to plan ahead, when the show finally is in progress it will be discovered that some little detail has been slighted or overlooked. Let me tell you from personal experience that this should not discourage you but should serve to reinforce your determination to make the next one an even better one! Good luck in your endeavors.

RECOMMENDED SHOW SCHEDULE—OFFICIAL AMARYLLIS SHOWS

The following schedule has been adapted from the 1967 schedule worked out by Mr. Mahan, Registrar, and Show Chairman, Men's Amaryllis Club of New Orleans. Mrs. A. C. Pickard of the Houston Amaryllis Society has suggested the addition of numbered new *Amaryllis* species under Section III and this has been adopted. Under Floral Arrangements Sections, "Section XI.—Floral Arrangements featuring Amaryllis" has been added to complete the Official schedule.

Other local societies may use this as a model in working out their own schedules.

A. HORTICULTURAL SECTIONS—POTTED SPECIMENS

SECTION I—Registered and Named Hybrids

Div. 2—Long Trumpet Hybrids	By Name
Div. 3—Belladonna Type Hybrids	” ”
Div. 4—Reginae Type Hybrids	
A. Markedly Imbricated Type	” ”
B. Less Imbricated Type	” ”
Div. 5—Leopoldii Type Hybrids	
A. Markedly Imbricated Type	” ”
B. Less Imbricated Type	” ”
Div. 6—Orchid-flowering Hybrids	” ”
Div. 7—Double Hybrids	” ”
Div. 8—Miniature Hybrids	” ”
Div. 9—Unclassified Hybrids	” ”

SECTION II—Non Registered and Un-Named Hybrids

Div. 2—Long Trumpet Hybrids	By Color
Div. 3—Belladonna Type Hybrids	” ”
Div. 4—Reginae Type Hybrids	
A. Markedly Imbricated Type	” ”
B. Less Imbricated Type	” ”
Div. 5—Leopoldii Type Hybrids	
A. Markedly Imbricated Type	” ”
B. Less Imbricated Type	” ”
Div. 6—Orchid-flowering Type Hybrids	” ”
Div. 7—Double Hybrids	” ”
Div. 8—Miniature Hybrids	” ”
Div. 9—Unclassified Hybrids	” ”

SECTION III—Cultivated Wild Species

By Name
or number

SECTION IV—Non Registered and Named Hybrids

Div. 2—Long Trumpet Hybrids	By Name
Div. 3—Belladonna Type Hybrids	” ”
Div. 4—Reginae Type Hybrids	
A. Markedly Imbricated Type	” ”
B. Less Imbricated Type	” ”
Div. 5—Leopoldii Type Hybrids	
A. Markedly Imbricated Type	” ”
B. Less Imbricated Type	” ”
Div. 6—Orchid-flowering Hybrids	
Div. 7—Double Hybrids	” ”
Div. 8—Miniature Hybrids	” ”
Div. 9—Unclassified Hybrids	” ”

B. HORTICULTURAL SECTIONS—CUT SPECIMENS

SECTION V—REGISTERED AND NAMED HYBRIDS **By Name**
Same subdivisions as Section I

SECTION VI—Non-Registered and Un-Named Hybrids **By Color**
Same subdivisions as Section II

SECTION VII—Cultivated Wild Species **By Name**

SECTION VIII—Non-Registered and Named Hybrids **By Name**
Same subdivisions as Section IV

COLOR CATEGORIES:

Solid White	* White with other color
Solid Pink	* Pink with other color
Solid Salmon	* Salmon with other color
Solid Rose	* Rose with other color
Solid Orange	* Orange with other color
Solid Light Red	* Light Red with other color
Solid Dark Red	* Dark Red with other color

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* The named color shall be the predominating color.

C. FLORAL ARRANGEMENTS SECTIONS

SECTION IX—Single Floret Specimens

Registered and named only—by name. Competition in this section is open only to members of the Men's Amaryllis Club of New Orleans, Inc.,** and limited to three entries per member, grown and bloomed by the member-owner.

SECTION X—Two-floret Specimens

Scapes with two florets, Registered or Non-Registered, Named or unnamed, potted or cut specimens. Not to be judged in competition against any entry in horticulture sections and will be awarded special ribbons of appreciation where deserving.

SECTION XI—Floral Arrangements featuring Amaryllis

No awards or ribbons in Sections IV, VIII, IX, and X can be counted toward any higher award or toward any of the sweepstakes awards.

** The local Amaryllis society can insert its name in place of the Men's Amaryllis Club of New Orleans, Inc.

APPLICATION PROCEDURE FOR TAKING THE OFFICIAL AMARYLLIS JUDGES EXAMINATION

The following application form has been prepared by Mrs. Bert Williams and W. Quinn Buck, and has been approved by the Southern California Amaryllis and Hemerocallis Society, and the American Amaryllis Society (affiliated with the American Plant Life Society). This procedure applies only to the Southern California area.

APPLICATION BLANK FOR TAKING THE OFFICIAL AMARYLLIS JUDGES' EXAMINATION OF THE AMERICAN AMARYILLS SOCIETY (AFFILIATED WITH THE AMERICAN PLANT LIFE SOCIETY).

The requirements for becoming an Official Amaryllis Judge:

1. Current membership in The American Plant Life Society (The American Amaryllis Society), and in the affiliated local society giving the Official Judges' examination.
2. Growing of at least 15 named hybrid Amaryllis clones. (This requirement can be waived **only** if the Examining Judges know of the applicant's experience over a period of years, and believe him to be qualified to take the examination because of his experience).
3. At least 3 years' experience in growing hybrid Amaryllis clones and species.
4. Applicant must pass a preliminary examination satisfying the Examining Judges of his appreciation and understanding of the elements of a good Amaryllis.
5. Applicant must pass the Official Judges' examination. After grading by the examining Judges, who must agree unanimously that the applicant has answered the questions correctly, the examination paper will then be sent to the Officers of the American Amaryllis Society (affiliated with the American Plant Life Society), who have the duty to do the final grading and the accrediting of the new Judge. Thereafter, the Official Judge will be eligible to judge in any Official Show of the American Amaryllis Society, when invited to judge by the appropriate Show Chairman, who should consult the Senior Judge of the area or check the lists of accredited Official Judges as published in PLANT LIFE annually.
6. All Official Judges must attend regular Judges' Council meetings in order to keep informed about new developments.

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Applicant's name ....

Address ....

City .... State .... Zip Code ....

Number of named clones grown .... Years of Experience ....

AMARYLLIS NOTES, 1968

HAMILTON P. TRAUB

Hymenocallis amancaes subsp. *herbertiana* Traub, *subsp. nov.* Syn.- *Ismene amancaes* var. 2, Herb. Amaryll. 222. 1837.

Poculo staminali in lobos non fisso; odore jucundiore.

Tepalsegs spreading, staminal cup not cleft into lobes, but including the filaments and projecting 6.5 mm. beyond their insertion; scent more agreeable. Peru. It is hoped that some one will re-collect this plant.

Milleae Traub, *tribus nov., (Amaryllidac.).* Rhizoma cormosa; perigonium regulare; ovarium ad apicem gynophorii positum. Typus: Genus *Milla* Cav.

Brodiaeeae Traub, *tribus nov.,* Perigonium regulare, inferne tubulosum, superne in segmentis 6 divisum; rhizoma cormosa; pedicelli ad apicem saepe articulati. Typus: genus *Brodiaea* J. E. Smith.

Tristagma narcissoides (R. A. Phil.) Traub, *comb. nov.* Syn.- *Stemmatium narcissoides* R. A. Phil., Anal. Univ. Chile 43: 551-552. 1873.

Nothoscordum graminifolium (R. A. Phil.) Traub, *comb. nov.* Syn.- *Steinmannia graminifolia* R. A. Phil. Anal. Univ. Chile p. 10. 1884.

Narcissus x *perezlaraii* Traub, *nom. nov.* Syn.—*Carregnoa dubia* perez-lara, Anal. Soc. Esp. Hist. Nat. 11: 399.1882, non *Narcissus dubia* Gouan, Illustr. et Obs. Bot. 22. 1773.

Amaryllis starkii Nelson & Traub, *sp.* nov., Plant Life 19: 37-40, Figs. 7 & 8. 1963. *Holonomenifer:* Ira S. Nelson, n. 1134, Univ. S.W. La. Herbarium: *isonomenifers*: Ira S. Nelson, s. n. (=nos. 1081 & 1082 TRA). Nomenifer specimens not cited originally in 1963 due to an oversight.

Narcissus loiseleuri (Rouy) Traub, *comb. nov.* Syn.—*Narcissus triandrus* var. *loiseleuri* Rouy, in Flore de France. 1908.

Narcissus radiiflorus var. *exsertus* clone 'Poetarum', Traub, *clone nov.* Syn.- *Narcissus poetarum* Haw., Mon. Narciss. 14. 1831; Pugsley, Jour. Bot. Vol. 53, Suppl. 2. page 42. 1915.

Pancratium landesii Traub, *sp. nov. (Amaryllidac.)*.—Foliis oblongis, parte inferiori angustatis; umbella uniflora; segmentis tepalorum linearibus acutis; poculo staminali segmentis tepalorum dimidio breviore. (Fig. 14). On coast near Salahah, Zufur Region, Sultanate of Muscat and Oman.

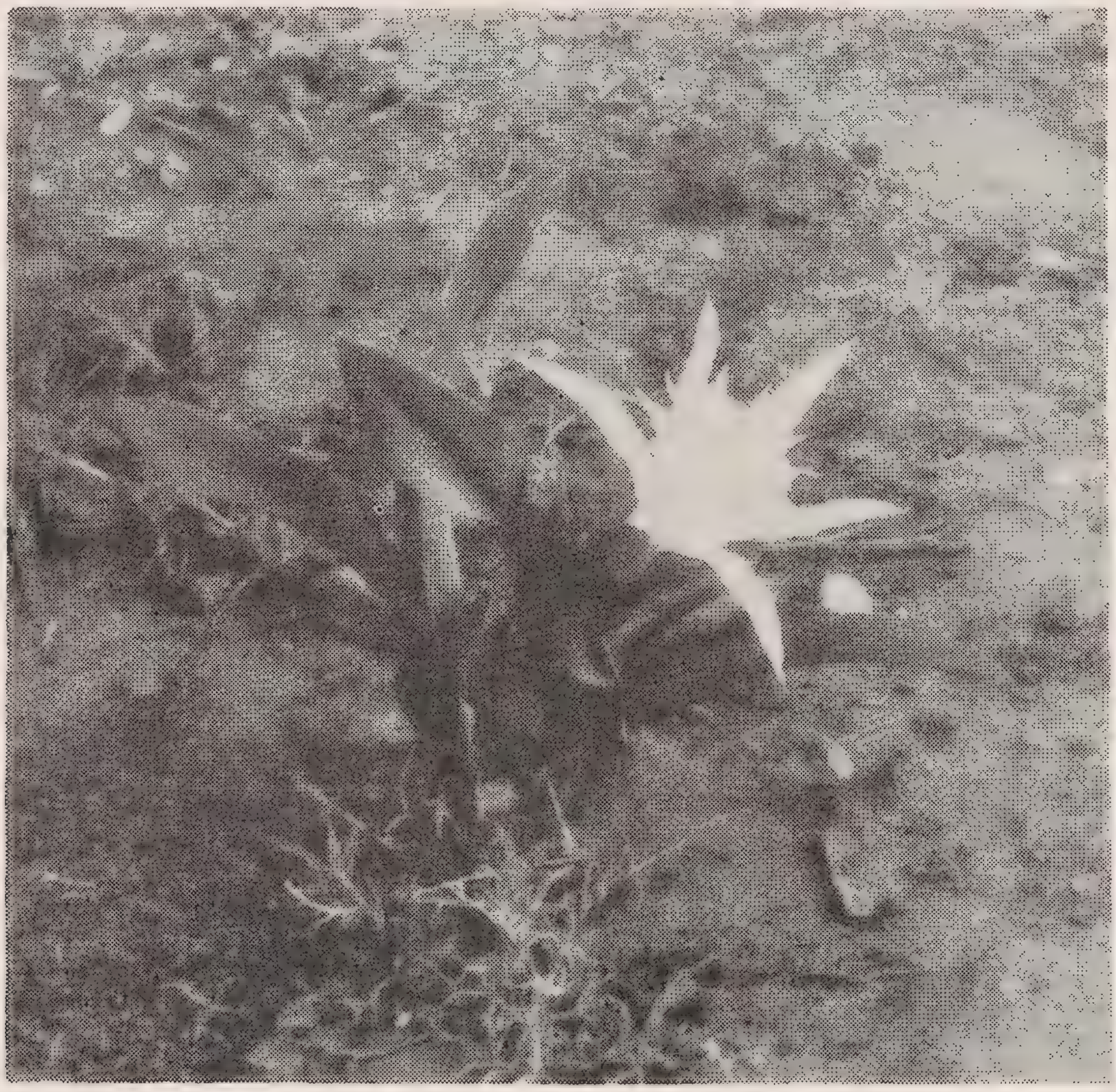

Fig. 14. **Pancratium landesii** Traub, **sp. nov.** Collected and photographed by Hugh C. Landes, in 1963, on the coast near Salahah, Zufur region, Sultinate of Muscat and Oman. Mr. Landes was then engaged as food consultant in Muscat and Oman.

Tribe *Hesperocalleae* Traub, *tribus nov.*, subfam. *Allioideae* (Amaryllidac.) Odora plantae alliacea; rhizoma bulbosa; foliis linearibus; inflorescentiis terminalibus racemiformibus; floribus fragrantibus per bracteis subtentibus. Typus: genus *Hesperocallis.* A. Gray.

Infrafamily *Allioidinae* Traub, *infrafam. nov.*, subfam. *Allioideae* (Amaryllidac.). Rhizoma rhizomatosa vel bulbosa; floribus regularibus vel irregularibus; staminibus certis 6 vel 3. Typus: genus *Allium* L.

Infrafamily *Brodiaeoidinae* Traub, *infrafam. nov.*, subfam. *Allioideae* (Amaryllidac.) Rhizoma cormiformi; floribus regularibus; ovario ad apicem pedicelli vel in gynophoro gerente; staminibus certis 6 vel 3. Typus: genus *Brodiaea* J. E. Smith.

TRAUB—**AMARYLLIS NOTES,** continued on page 19.

IMPROVEMENTS IN THE CLASSIFICATION OF THE GENUS **NARCISSUS** L.

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Some caryological studies accomplished recently on the genus *Narcissus* L. have led us to a somewhat different classification from that which we published in 1951. This classification is outlined here with reference to the caryological data.[1]

GENUS **NARCISSUS** L.

Sp. Pl. *1*: 289 (1753); Gen. Pl. ed. 5: 141 (1754).

Subgen. I. **Hermione** (Haw.) Spach, Hist. Vég. Phan. **12**: 443 (1846)

$x=5$, $x_2=10$, 11 (5+6); $x_3=11$. Chromosome complements always with cephalobrachial elements, rarely with one long only, often with several (6-8) long and short. Polyploidy frequent.

Sect. I. **Serotini** Parl., Fl. Ital. **3**: 157 (1858) p.p. excl. **N. elegans** Spach.

x=5=1 LL+1 'Ll+1 LP+1 L.+1 li, or x=15=2 LL+2 LP+3 Lp+1 L.+2 li+1 P.'+4 P.

1. *N. serotinus* L.
   var. *serotinus* (2x, 6x)
   var. *emarginatus* Chabert *
   var. *deficiens* (Herb.) Baker *

Sect. II. **Hermione**
$x_2=10$; $x_3=11$.
Subsect. I. **Angustifoliae** A. Fernandes in Bol. Soc. Brot. sér. 2, **40**: 309 (1966).
2. *N. elegans* (Haw.) Spach
   var. *elegans*, x_2=10=2 Lp+2 L.+1 li+1 lp+1 P.'+3 P.
   var. *intermedius* J. Gay, Idem
   var. *flavescens* Maire *
   var. *fallax* Font-Quer, x_2=10=3 Lp+2 L.+1 P.'+3 P.+1 pp
Subsect. II. **Hermione**
Ser. I. **Hermione**
x_2=10=2 Lp+2 L.+1 li+1 lp+1 P.'+3 P.
3. *N. corsyrensis* (Herb.) Nym.*
4. *N. tazetta* L. (2x)
5. *N. ochroleucus* Lois.*
6. *N. patulus* Lois. (2x)
7. *N. cypri* Sweet (3x)
Ser. II. **Luteiflorae** Rouy, Fl. Fr. **13**: 42 (1912).
x_3=11=1 Lp+2 L.+1 li+1 l.+2 P.'+3 P.+1 pp
8. *N. italicus* Ker-Gawl. (2x)
9. *N. Bertolonii* Parl.
   var. *Bertolonii* (2x)

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[1] In this report, x, x_2 and x_3 mean, respectively, primary, secondary and tertiary basic chromosome numbers; the chromosomes in the haploid formulae (haploid chromosome complements) are represented by the symbols devised in our works of 1931 and 1934 (see bibliographical list); the degree of polyploidy of the taxa is indicated by 2x, 3x, 4x, etc.; an asterisk following the name of a taxon indicates that it has not yet been studied caryologically.

var. *algericus* (Roem.) Maire & Weiller*
var. *primulinus* Maire*
var. *discolor* Batt.*
10. *N. aureus* Lois. (2x)
11. *N. cupularis* (Salisb.) Bertol. ex Schultes f.*

Ser. III. Albiflorae Rouy, Fl. Fr. **13:** 49 (1912).[2]
x_3=11=1 Lp+2 L.+1 li+1 l.+2 P.'+3 P.+1 pp
12. *N. pachybolbus* Dur. (2x)
13. *N. canariensis* Herb. (2x)
14. *N. panizzianus* Parl. (2x)
15. *N. barlae* Parl. (2x)
16. *N. polyanthos* Lois. (2x)
17. *N. papyraceus* Ker-Gawl. (2x)

Sect. III. **Aurelia** (J. Gay) Baker, Hand. Amaryll.: 12 (1888).
x_2=11 (5+6)=1 LL+1 Lp+2 L.+1 l.+1 P.'+4 P.+1 pp
18. *N. broussonetii* Lag.
f. *broussonetii* (2x)
f. *grandiflorus* (Batt. & Trab.) Maire (4x)

Subgen. II. **Narcissus**

x=7; x_2=13. Chromosome complements usually without cephalobrachial elements, rarely with one short (*N. gaditanus, N. minutiflorus, N. obesus* and some tetraploid derivatives of *N. fernandesii*). Polyploidy present in certain sections. absent in others.

Sect. I. **Jonquilla** DC., Fl. Fr. **6:** 325 (1815); in Redouté, Liliac. **8:** Adnot. t. 486 (1816) p.p.

Subsect. I. **Jonquilla**

x=7=2 Ll+1 Lm+1 Lp+1 li+1 lp+1 lp'. Polyploidy present in some species.

19. *N. jonquilla* L.
var. *jonquilla* (2x)
var. *henriquesii* Samp. (2x)
var. *minor* (Haw.) Baker*
var. *stellaris* Baker*
20. *N. fernandesii* Gomes Pedro
var. *fernandesii* (2x)
var. *major* A. Fernandes (4x)
21. *N. willkommii* (Samp.) A. Fernandes (2x)
22. *N. viridiflorus* Schousb. (4x)

Subsect. II. **Juncifoliae,** subsect. nov.[3]

x=7. Polyploidy unknown.

23. *N. requienii* Roem.
var. *requienii,* x=7=2 Ll+2 Lp+1 li+1 Pp+1 Pp'
var. *pallens* (Freyn. ex Willk.) A. Fernandes*
24. *N. gaditanus* Boiss. & Reut., x=7=2 Ll+1 Lp+1 Lp'+1 li+1 Pp+1 P.
25. *N. minutiflorus* Willk, Idem

Sect. II. **Apodanthae** A. Fernandes in Bol. Soc. Brot ser. 2, **40:** 241 (1966).

x=7=1 LL+2 Ll+1 Lp+1 li+1 lp+1 Pp'. Polyploidy unknown.

26. *N. rupicola* Duf.
ssp. *rupicola* (2x)

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[2] **N. dubius** Gouan, a hybrid between a tetraploid form of **N. Requienii** Roem. and a diploid form of a species of the Ser. **Albiflorae,** with 2n=50 (28 R+ +22 A), may be placed in this series.

[3] Plantae graciles; folia viridia, valde angusta, supra leviter canaliculata, infra convexa et leviter striata; perigonii tubus interdum incurvatus; flores fragrantes.

ssp. *pedunculatus* (Cuatr.) Laínz*
ssp. *marvieri* (Jah. & Maire) Maire & Weiller*
27. *N. watieri* Maire (2x)
28. *N. scaberulus* Henriq. (2x)
29. *N. calcicola* Mendonça (2x)

Sect. III. **Ganymedes** (Haw.) Schultes f. in Syst. Veg. **7**, 2: 933 (1830).
x=7=3 Lp+1 li+2 PP+1 Pp'. Polyploidy unknown.
30. *N. triandrus* L.
var. *triandrus* (2x)
var. *cernuus* (Salisb.) Baker (2x)
31. *N. concolor* (Haw.) Link (2x)

Sect. IV. **Bulbocodium** DC., Fl. Fr. **6**: 319 (1815); in Redouté, Liliac. **8**: Adnot. t. 486 (1816).
x=7; $x_2=13$. Polyploidy very frequent.
32. *N. bulbocodium* L.
var. *bulbocodium*, x=7=3 Lp+1 li+2 PP+1 Pp' (2x, 3x, 4x, 6x)
var. *nivalis* (Graells) Baker, Idem (2x)
var. *graellsii* (Webb) Baker*
var. *conspicuus* (Haw.) Baker (4x, 6x)
var. *serotinus* (Haw.) A. Fernandes (4x, 6x, 7x, 8x)
var. *citrinus* Baker (2x)
ssp. *praecox* Gatt. & Weiller
var. *praecox**
var. *paucinervis* Maire*
33. *N. obesus* Salisb., $x_2=13$=1 Ll+4 Lp+1 'Lp+1 li+4 PP+1 Pp+1 P. (2x, 3x)
34. *N. hedraeanthus* (Webb & Heldr.) Colmeiro*
35. *N. romieuxii* Br.-Bl. & Maire, $x_2=14$=5 Lp+2 li+1 lp'+5 PP+1 Pp'
ssp. *romieuxii*
var. *romieuxii*
var. *rifanus* (Emb. & Maire) A. Fernandes
ssp. *albidus* (Emb. & Maire) A. Fernandes
var. *albidus*
var. *zaianicus* (Maire, Weiller & Wilczek) A. Fernandes
36. *N. cantabricus* DC., x=7=2 Lp+1 li+1 lp'+3 PP
ssp. *cantabricus*
var. *cantabricus**
var. *foliosus* (Maire) A. Fernandes (4x)
var. *Kesticus* (Maire & Wilczek) A. Fernandes (4x)
var. *petunioides* A. Fernandes*
ssp. *monophyllus* (Dur.) A. Fernandes (2x)
ssp. *tananicus* (Maire) A. Fernandes (4x)

Sect. V. **Pseudonarcissus** DC., Fl. Fr. **6**: 319 (1815); in Redouté, Liliac **8**: Adnot. t. 486 (1816).
x=7=1 Ll+1 LP+1 Lp+2 li+1 lp+1 Pp'. Polyploidy frequent.
37. *N. longispathus* Pugsley (2x)
38. *N. nevadensis* Pugsley*
39. *N. hispanicus* Gouan
var. *hispanicus* (2x, 3x, 6x)
var. *propinquus* (Herb.) Pugsley (2x)
var. *spurius* (Haw.) Pugsley*
var. *concolor* (Jord.) Pugsley*
40. *N. confusus* Pugsley*
41. *N. obvallaris* Salisb. (2x)
42. *N. portensis* Pugsley (2x)
43. *N. pseudonarcissus* L.
var. *pseudonarcissus* (2x)
var. *platilobus* (Jord.) Pugsley*
var. *insignis* Pugsley*

var. *pisanus* (Pugsley) A. Fernandes *
var. *montinus* (Jord.) Pugsley *
var. *minoriformis* Pugsley *
var. *humilis* Pugsley *
var. *festinus* (Jord.) Pugsley *
var. *porrigens* (Jord.) Pugsley *
44. *N. pallidiflorus* Pugsley
var. *pallidiflorus* (2x)
var. *intermedius* Pugsley (2x)
45. *N. macrolobus* (Jord.) Pugsley *
46. *N. gayi* (Hénon) Pugsley (2x)
47. *N. nobilis* (Haw.) Schultes f.
var. *nobilis* (4x, 6x)
var. *leonensis* (Pugsley) A. Fernandes (6x)
48. *N. moschatus* L. (2x)
49. *N. alpestris* Pugsley (2x)
50. *N. tortuosus* Haw. (2x, 4x)
51. *N. albescens* Pugsley *
52. *N. bicolor* L.
var. *bicolor* *
var. *lorifolius* (2x)
53. *N. abscissus* (Haw.) Schultes f.
var. *abscissus* (2x)
var. *serotinus* (Jord.) Pugsley *
var. *graciliflorus* Pugsley *
var. *tubulosus* (Jord.) Pugsley *
54. *N. minor* L. (2x)
55. *N. provincialis* Pugsley *
56. *N. pumilus* Salisb. (2x)
57. *N. nanus* Spach (2x)
58. *N. parviflorus* (Jord.) Pugsley *
59. *N. asturiensis* (Jord.) Pugsley (2x)
60. *N. cyclamineus* DC. (2x)

Sect. VI. **Narcissus**
x=7=1 Ll+1 LP+1 Lp+2 li+1 lp+1 Pp'. Polyploidy present.
61. *N. poeticus* L.
var. *poeticus* (2x, 3x)
var. *verbanensis* Herb.*
var. *hellenicus* (Pugsley) A. Fernandes *
var. *recurvus* (Haw.) A. Fernandes (3x)
var. *majalis* (Curtis) A. Fernandes *
62. *N. radiiflorus* Salisb.
var. *radiiflorus* (2x)
var. *stellaris* (Haw.) A. Fernandes *
var. *exsertus* (Haw.) A. Fernandes *

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NOTHOSCORDUM NOTES, 1967

PEDRO FELIX RAVENNA, *Buenos Aires, Argentina*

In the 1967 PLANT LIFE (vol. 23, page 50), the name *Nothoscordum lloydiflorum* Beauv. was restored, but further study has revealed that the correct name of this species is:

Nothoscordum vittatum (Griseb.) Rav. *comb. nov.* Syn.—*Milla vittata* Grisebach, Goett, Abhandl. 24:318. 1879.- *Nothoscordum lloydiflorum* Beauverd, Bull. Herb. Boiss. ser. 2, 8:998, f. 2. 1908.-*Beauverdia vittata* (Griseb.) Herter, Boissiera 7:511. 1943.-*Beauverdia lloydiflora* (Beauv.) Herter. 1. c.: 510.- *Ipheion vittatum* (Griseb.) Traub, Pl. Life 5:50. 1949.- *Ipheion lloydiflorum* (Beauv.) Traub, 1 c.- *Tristagma vittatum* (Griseb.) Traub, 1.c. 19: 61. 1963.- *Tristagma lloydiflora* (Beauv.) Traub, 1.c.

Specimens: Uruguay, Canelones, Independencia, in campis; leg. C. Osten 5222, 3-V-1908 (iso-type of *N. lloydiflorum* S1). Argentina Entre Ríos, Concepción del Uruguay, en el campo entre las gramas, fl. blanca; leg. Lorentz 968, 1-V-1877 (isotype of *Milla vittata* BAF).

This species possibly is not distinct from *Nothoscordum setaceum* (Bak.) Rav. (see below), of which unfortunately I had access only to a phototype. *Nothoscordum lloydiflorum* Beauv. differs from it mainly by the more papillose and narrower leaves; these characters are variable and are of doubtful significance in characterizing species.

Nothoscordum setaceum (Bak.) comb. nov.- *Milla setacea* Baker, Journ. Linn. Soc. London 11:385. 1871.- *Tristagma setaceum* (Bak.) Traub, Pl. Life 19:61. 1963.

Owing to the fact that this species was never recollected in the province of Tucumán, I feel reluctant in stating place of origin. Possibly it is a native of the province of Santa Fe, which was on Tweedie's route, or may be even to Entre Ríos. It is known that some specimens from that collector were wrongly labelled by him or by persons who received them.

Specimen: Argentina, Tucumán; leg. Tweedie (phototype from K).

SUCROSE AS THE SOLE CONSTITUENT OF THE HONEY OF **CRINUM ASIATICUM**

Judy L. Zorbach and William W. Zorbach

Early in the summer of 1964, the writers obtained two magnificent specimens of *Crinum asiaticum* L. from Mr. Wyndham Hayward; these were planted in a small, but well-prepared bed in their garden in Washington. Although it is possible to winter over this species in the Washington area with a great deal of protection, the results are not satisfactory, especially if arrival of spring is delayed.

To avoid risk of loss or damage to the newly acquired specimens, each was removed from the yard in early fall, and replanted in 16-inch redwood tubs in ''gritty'' (sandy) soil. Before the first frost arrived the tubs were brought inside the writers' conservatory, the construction of which had just been completed. Under these conditions, the two crinums thrived and bloomed well during the winter months, and around May 1 of the following year they were brought outside and exposed to full sun, and cared for in this way until cold weather arrived, after which they were returned to the conservatory. By June of this year (1967), the bulbs had attained a diameter of about 7 inches; they were at this time cut back severely and carefully removed from the tubs preparatory to shipping to the writers' new location in New Iberia, Louisiana. They were subsequently replanted outside and have already made good growth at this writing.

It was during the winter months in Washington in the conservatory when the honey production of *C. asiaticum* was acutely noted, for, under these conditions, the leaves were not washed clean by the rain, and an opportunity for the careful observation of the behavior of the flowers was provided. It will be disclosed later on that the sole constituent of the honey is sucrose, but this is not at all surprising, inasmuch as the sugar occurs almost universally throughout the plant kingdom in the juices, seeds, leaves, fruits, flowers, and roots of plants; sucrose was reported in all of the 281 species of phanerogams studied by Bourquelot and his associates *(1)*.

What is remarkable is that, in light of our somewhat limited experience, *C. asiaticum* produces *copious* quantities of honey. As the individual flowers wilt, a clear, colorless sirup exudes from the throats of each, forming drops which frequently fall upon the leaves. The sirup is a very concentrated solution, as evidenced by the fact that the drops do not run down the leaves in watery fashion, and also because the sirup thus collected becomes completely crystalline in a few days It is estimated that each flower produces 2-3 drops of sirup, accounting for 250-500 mg. of sugar, and, from an average of 15 blooms per umbel, this would amount to 3.75-7.5 grams! Of the various other amaryllids, and, in particular, of several other crinums grown by the writer, such a profuse exudate of honey has not been noted.

Although it is unlikely that the constitution of the honey of *C. asiaticum* has been previously reported, an exhaustive literative search was not made. Regardless of possible priority, the authors set about independently to perform constitutional studies in an effort to identify the "new" sugar, with a view to preparing an article of possible interest to amaryllid enthusiasts.

Collection of the crystallized honey was made by carefully scraping it from the leaves. Although contaminated by some dust, the crystals had m.p. 191-196° [this is an excellent value for sucrose, which does not have a definite melting point *(1)*. The range varies, depending upon the medium used for purification.] The crystals were then dissolved in methanol, the solution was decolorized and filtered, and a large volume of acetone was added. After two days, the beautifully crystalline sugar was collected by filtration, and had m.p. 188-192°. When admixed with a sample of authentic sucrose (table sugar) of m.p. 186-190°, no depression was observed. The recrystallized unknown sugar failed to give a positive "silver mirror" test with ammoniacal silver nitrate, and did not form a phenylhydrazone; therefore, it was either a non-reducing disaccharide or oligosaccharide. It gave a positive diazouracil test, strongly suggestive of sucrose. Acetylation of the sugar in pyridine gave, after processing, a sirup which crystallized readily from ethanol-pentane after seeding with an authentic specimen[1] of octa-*O*-acetylsucrose. The acetylated derivative had m.p. 85-87°, undepressed when admixed with an authentic sample[1] of octa-*O*-acetylsucrose of m.p. 84.5-86°. The original sugar was homogeneous on thin-layer chromatograms and had an *Rf* value corresponding to that of sucrose. Its optical rotation was $[\alpha]_d + 66°$ in water (lit. *(1)* $[\alpha]_d +66.53°$ in water). The honey of *C. asiaticum* is, therefore, composed of pure sucrose.

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[1] From a sample in the authors' collection, originally prepared by the late Prof. Geza Zemplén, Hungarian carbohydrate chemist and discoverer of the widely used Zemplén method for the saponification of esters, during his brief tenure as visiting professor at Georgetown University, Washington, D. C.

The authors gratefully acknowledge the technical assistance of Dr. and Mrs. K. Venkatramana Bhat.

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(1) W. Z. Hassid and C. E. Ballou, in W. Pigman (ed.), *The Carbohydrates,* Academic Press, Inc., New York, N. Y., 1957, pp. 501-502.

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BAHAMA ISLANDS **HYMENOCALLIS** SPECIES

W. QUINN BUCK

In July of 1964 Dr. Hamilton P. Traub sent to me at the Los Angeles State and County Arboretum, Arcadia, Calif., a group of bulbs which included the very rare *Hymenocallis sp.,* 'Man-o'-War' Cay. (T-

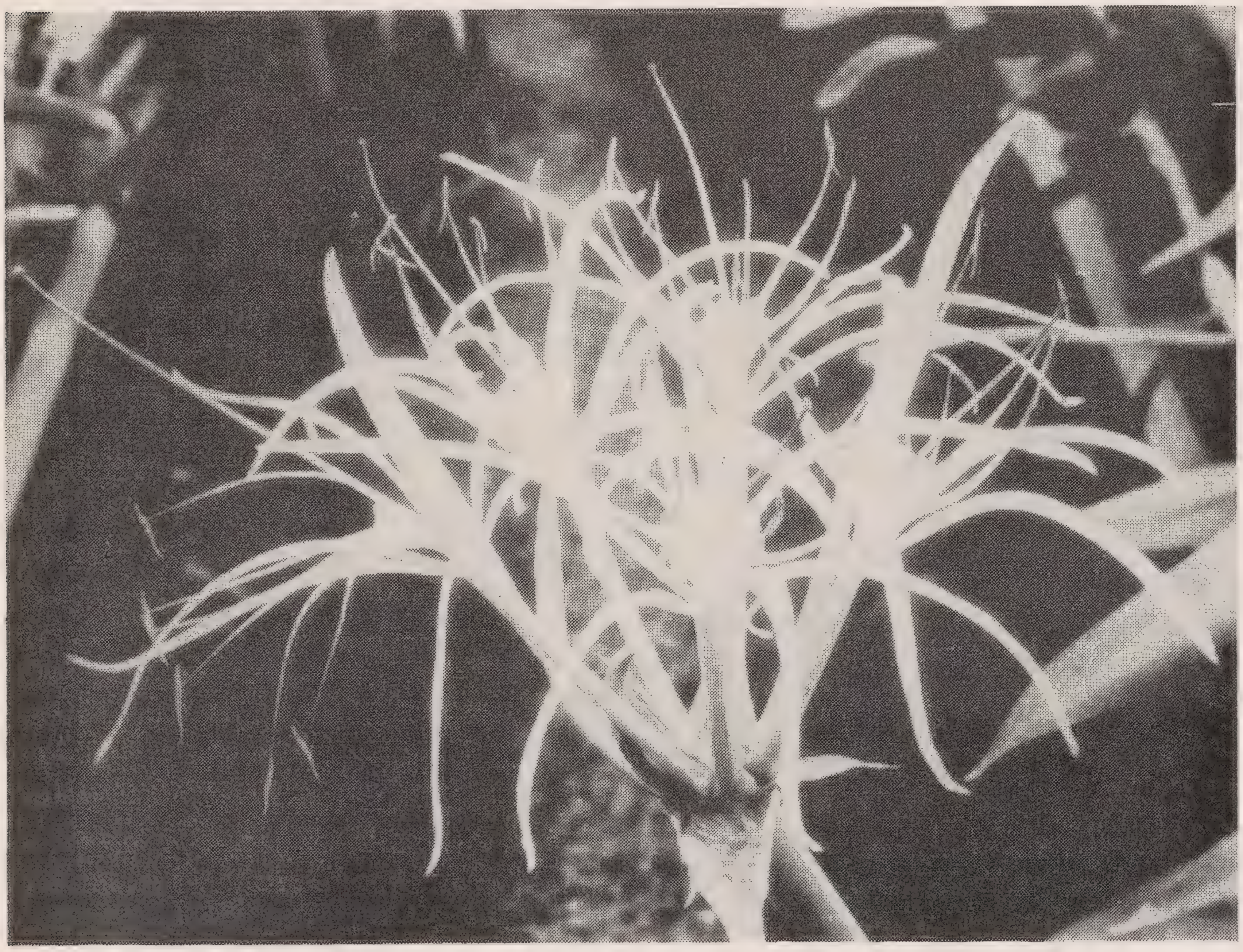

Fig. 15. **Hymenocallis** sp. T-775, collected by Mr. Henry C. Gibson, Jr., on Man-O-War, Abaco, Bahama Islands, in sandy soil. Close up of an umbel as grown by W. Quinn Buck, Arcadia, Calif., in 1967. See also Fig. 16. Photo by Jack V. McCaskill.

775) from Abaco, Bahama Islands. This small bulb was started in a six-inch pot in a mixture of siltsand and peat in equal volume. Early in 1965 it was shifted into a 10-inch fern pot. Since my retirement from the Arboretum in 1965 this species has been growing in the greenhouse at my home, where it has seemed to be quite happy.

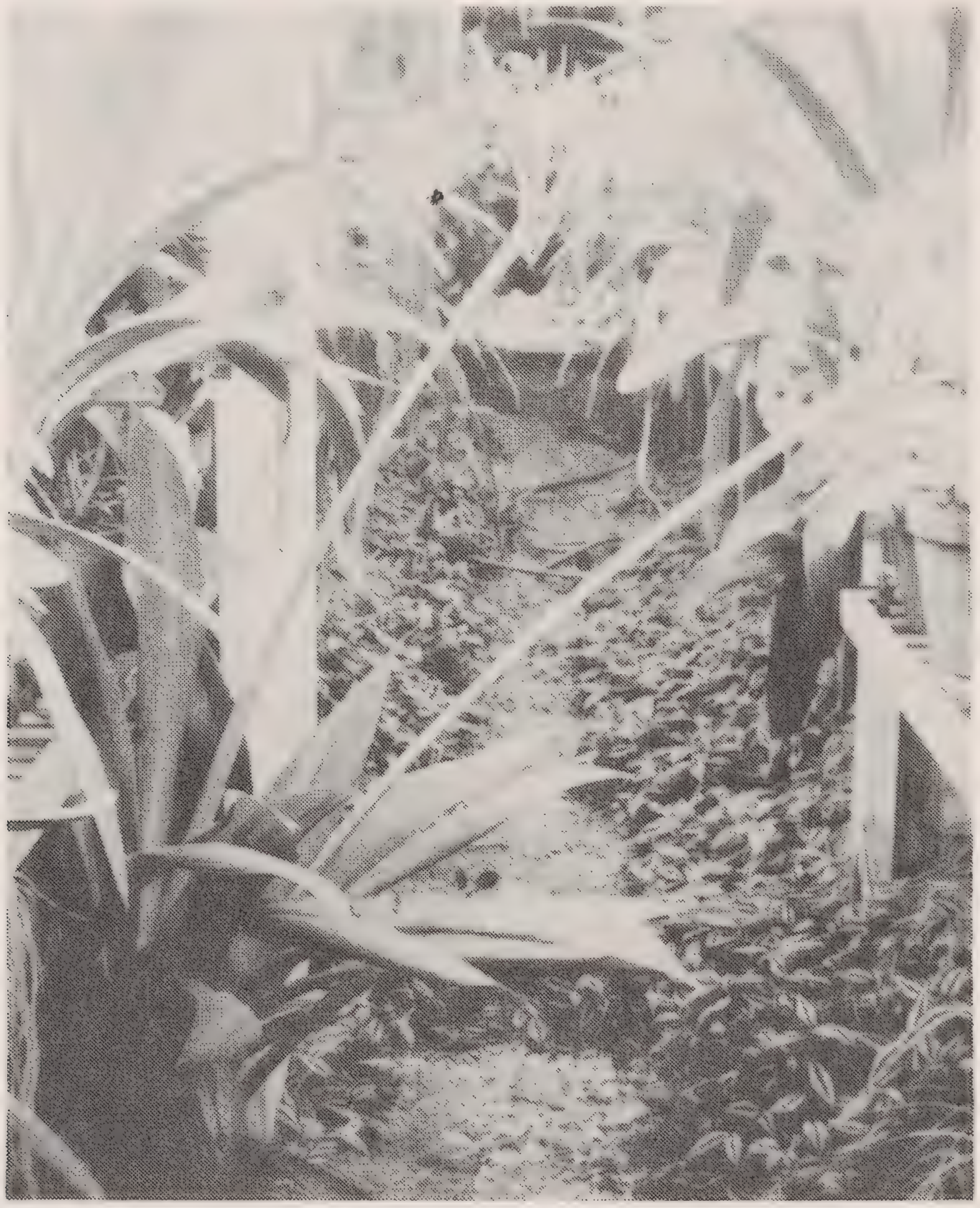

Fig. 16. **Hymenocallis** sp. T-775, collected by Mr. Henry C. Gibson, Jr., on Man-O-War Cay, Abaco, Bahama Islands, in sandy soil 1964. Plant as grown in W. Quinn Buck's greenhouse, Arcadia, Calif., the second scape with umbel and the fading first umbel produced in 1967. Photo by Jack V. McCaskill.

Growth has been very good in the bright, warm south half of the greenhouse, where it has received abundant water at all seasons. In 1966 there were two handsome flower spikes, and in 1967 there have been three in succession during August and September, the first from the large center bulb, and then one from each of the large offsets in turn. The 38-inch spike was topped by a widespread 12-inch umbel of clear white, spicy scented flowers. It has so far proved to be a very satisfactory greenhouse plant.

The full-length picture (Fig. 16) shows the second scape with umbel and the fading first scape with umbel of 1967. A third scape with umbel bloomed in late September. The close-up (Fig. 15) shows the handsome umbel.

PLANT LIFE LIBRARY—continued from page 32.

TAXONOMY, by R. E. Blackwelder. John Wiley & Sons, 605 3rd Av., New York, N. Y. 10016. Subtitled, "A Text and Reference Book", it is in the main "concerned with the practical tasks of the taxonomist." The book is intended for a beginning course, and an advanced one, on the theory of taxonomy, embracing six parts: (a) introduction, (b) elements of practice, (c) animal diversity and the major problems of grouping, (d) advanced practice, (e) theoretical aspects, and (f) special requirements of zoological nomenclature.

MEMORIALS OF JOHN BARTRAM AND HUMPHREY MARSHALL, by William Darlington. Hafner Publ. Co., 31 E. 10th St., New York, N. Y. 10003. 1967. Pp. 585. Illus. $20.00. This reprint of a frequently cited book, first published 117 years ago, will be welcomed by all plant scientists, horticulturists and gardeners. The book is prefaced with chronologies in the lives of John Bartram and Humphrey Marshall, and revised indices to the personal names, ship captains and plant names. This charming book, dealing with 18th century botanical history in the American Colonies, is highly recommended.

THE WILD GARDENER IN THE WILD LANDSCAPE, by Warren G. Kenfield. Hafner Publ. Co., 31 E. 10th St., New York, N. Y. 10003. 1966. Pp. 232. Illus. $7.50. Subtitled, "The Art of Naturalistic Landscaping", this stimulating book provides a new outlook on the subject. The topics covered include five modes of landscape appreciation, revolution in land-use, the art of eliminating, perpetuating, and adding plants. This outstanding new book is highly recommended.

POLLEN MORPHOLOGY AND PLANT TAXONOMY: ANGIOSPERMS, by G. Erdtman. Hafner Publ. Co., 31 E. 10th St., New York, N. Y. 10003. Reprint Edition, 1966. Pp. 553. Illus. $14.00. This reprint of the 1954 Edition, with corrections and an addendum, will be welcomed by all plant scientists. The topics covered include pollen preparations, pollen and spore morphology, and pollen descriptions of representatives of the plant families. A glossary, bibliography, index and addendum, complete the book. Highly recommended.

BIOCHEMISTRY OF CHLOROPLASTS. Vols. I and II, edited by T. W. Goodwin. Academic Press, Berkeley Square House, Berkeley Sq., London, W. 1.; and 111 5th Av., New York, N. Y. 10003. Vol. 1. 1966. Pp. 476. Illus. 115s; $18.00; Vol. II. 1967. Pp. 776. Illus., 160s; $29.00. The first and second volumes of this outstanding new series contain contributions from many authorities. Volume I includes papers on the structure and morphogenesis of chloroplasts; and chloroplast components.—lipids, proteins, lipoproteins, nucleic acids, pigments. Volume II, includes papers on the biogenesis in chloroplasts,—CO_2 fixation, carbohydrates, lipids, proteins and nucleic acids, pigments, photosynthetic phosphorylation; and biosynthetic mechanism in relation to morphogenesis. Highly recommended.

INTERNATIONAL REVIEW OF FORESTRY RESEARCH. Vol. 2, edited by J. A. Romberger and P. Mikola. Academic Press, 111 5th Av., New York, N. Y. 10003. 1967. Pp. 316. Illus. $15.00. This 2nd volume in the series contains contributions from seven outstanding authorities, including the history of forestry research in East Asia; influence of spacing on growth of conifers; influence of sylvicultural practice on wood properties; the forest energy balance; growth rates and growth perodicity of tree roots; and succession of organisms in discoloration and decay of wood. Highly recommended.

SYMBIOSIS. Vol. II, edited by S. Mark Henry. Academic Press, 111 5th Av., New York, N. Y. 10003. 1967. Pp. 443. Illus. $17.50. This 2nd volume in the series contains contributions from six outstanding authorities, including papers on insects and their endosymbionts; insect ectosymbiosis; ectosymbiosis in woodland-inhabiting insects; ectosymbiosis ofaquatic insects; avian symbiosis; and intestinal microorganisms of ruminants and other vertebrates. Highly recommended.

PLANT LIFE LIBRARY—continued on page 95.

3. GENETICS AND BREEDING

AN AMARYLLIS BREEDING PROJECT—1967 REPORT

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To one interested in using the *Amaryllis* species in breeding to produce new and different hybrids the 1967 season was, as usual, a mixture of limited successes and many failures. The limited successes provide the incentive to keep working at a challenging but sometimes frustrating hobby. I will describe some of the successes and omit most of the failures, except in a few cases where the information may be of help to those with similar interests in growing and hybridizing *Amaryllis* species.

First, I would like to make a few general observations in regard to setting seed with *Amaryllis* species and F-1 hybrids. The ability to set seed with the species is certainly much less than for most of the modern hybrid groups (e.g. the Dutch hybrids). Three reasons generally given for inability to set seed with the species are: (1) incompatibility due to differences in chromosome number, (2) incompatibility due to unknown differences which exist between divisions (subgenera) of the species and (3) sterility of one or both of the species being used. The point I want to make is that although a species may be known to be fertile, this does not mean that every clone of that species will be fertile. To cite a few examples: For four years I have tried to set seed, using a wide variety of pollen parents, on a clone of *A. evansiae* and several of its vegetative offsets. Over thirty pollinations were uniformly unsuccessful. Yet the fertility of *A. evansiae* as a pod parent was thoroughly demonstrated by the late Prof. Ira Nelson. Mr. Keith Brown (PLANT LIFE, 1967) reports on his inability to obtain seed using a 'Senorita' hybrid as a pod or pollen parent. I have had no such difficulty with my 'Senorita' hybrid, although it does perform better as a pollen parent. Some years back several individuals reported that *A. forgetii* collected by Dr. Goodspeed (PLANT LIFE, 1956) failed to set seed. *A. forgetii* collected by Dr. Vargas is reported to have set seed with the pollen of *A. reticulata stratifolia.* Two years ago Fred Buchmann and I both obtained *A. forgetii* collected by Dr. Cardenas in Bolivia. Although my plant has not bloomed, Fred has set seed on his and reports on his experiences in this issue.

About the only firm conclusion that can be drawn from these experiences is that some clones of *A. evansiae, A. forgetii* and 'Senorita' hybrids will set seed and others will not. If one finds that a certain species will not set seed he should try to obtain the species from another source and the problem may be solved.

I never cease to be amazed by the unique beauty and ease of culture of the 'Senorita' hybrids. Although outdoor culture has not been successful, planting three or four blooming size bulbs to an 8-10 inch pot gives a spectacular display. During spring, summer and early fall the pots are kept outdoors and monthly applications of liquid fertilizer promote the foliage growth necessary for heavy bloom. The pots are brought indoors early in November (into a glass-enclosed patio) and water applied sparingly. Bloom scapes appear by mid December and I have had bloom at Christmas. Each bulb normally makes two scapes (a few make three) with four to five flowers per scape. The creamy pink flowers are 4-4½ inches across, have a green throat and a wax-like sheen. Because of light conditions on my patio the scapes reach a height of 36-40 inches. In January, 1967 I counted 17 blooms open at one time on four bulbs in a single pot (see Figure 17). The scapes seem to be produced in two groups such that the blooming display lasts about six weeks. As though this were not sufficient, one or two out-of-season bloom scapes may appear during the summer.

'Senorita' performs better as a pollen parent than as a pod parent for me. I have seedlings from 'Senorita' crossed with a wide variety of Dutch hybrids including 'Royal Dutch', 'Christmas Gift', 'Marie Goretti', 'Little Diamond' and 'Golden Triumphator'. Most of these are growing well in outdoor beds, although some are grown in pots. Two (2 year old) seedlings bloomed this past season. One ('Christmas Gift' X 'Senorita') was pale pink, 6-6½ inches across and leopoldii type. Another ('Royal Dutch' X 'Senorita'), was a beautiful light rose. It appears that many of these hybrids produce offsets almost as freely as does 'Senorita', particularly in pot culture. More extensive bloom is anticipated for the 1968 season.

Four years ago I obtained from Prof. Claude Davis a small seedling bulb from the cross *(A. evansiae* x *A. agliae)* x *A. evansiae.* This hybrid has grown very well in pot culture and has bloomed for the past two seasons. In color and form it is almost indistinguishable from *A. evansiae.* About 3½ inches across, it is light cream yellow and of fairly full form. Its culture is easier than *A. evansiae,* not being nearly so critical regarding moisture and tendency to rot. When it first bloomed in 1966 no seed was set. This past season several seed pods were obtained from the original bulb and two of its offsets. Three pods resulted from 'White Christmas' as the pollen parent; only two of about fifty seed germinated. These are growing well and the possibility of large yellow hybrids is an incentive for the future. About a dozen seedlings were obtained by using the pollen of a fine specimen of the Davis hybrid *(A. evansiae* x *A. agliae).* These should give some interesting small yellow hybrids and they appear to be vigorous growers.

Early in 1966 I was able to obtain blooming size bulbs of *A. starkii* and *A. yungacensis.* These bulbs were collected by Dr. Cardenas in Bolivia and sent to Prof. Davis for distribution. *A. starkii* was originally collected by the late Prof. Ira Nelson in Bolivia in 1958 and named as a new species by Nelson and Traub (PLANT LIFE, 1963). This is a very distinctive species, principally because of the almost vertical posture of the perigone. A few weeks after potting my bulb of *A. starkii,* and before any leaf development, a bloom scape appeared. The scape was two flowered, the flowers being more pink than orange in color and very regular in form. In order to achieve maximum variation of progeny mixed pollen was used on both blooms. Pollen parents included *A. belladonna,* a white Dutch hybrid, the *A. evansiae* hybrid described previously and two unidentified species. Two pods were set and germination was excellent. At this writing more than fifty seedlings are in their second growing season and there is keen anticipation as to the characteristics of these hybrids. After maturing the seed

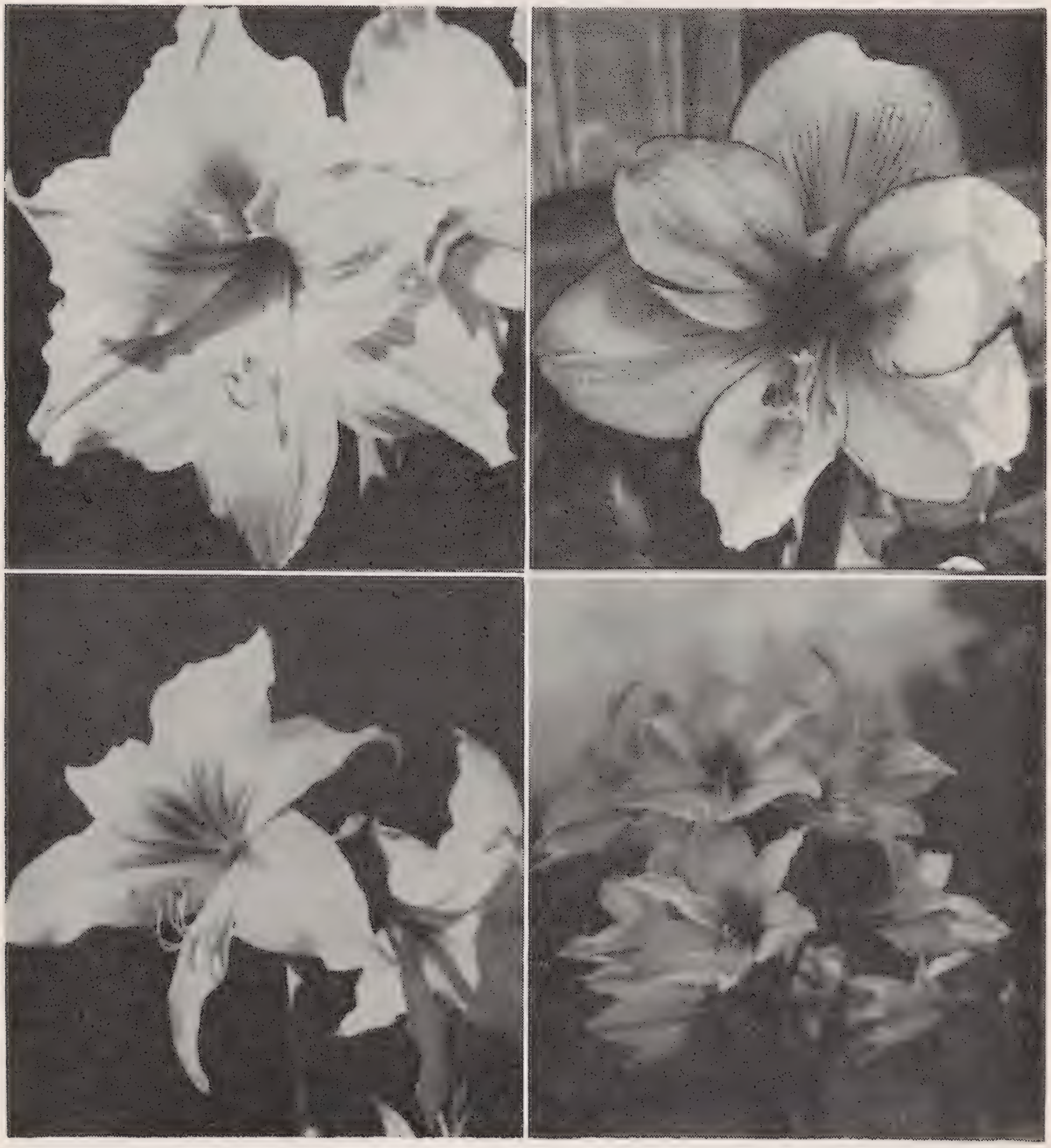

Fig. 17. **Amaryllis** grown by Mr. Joseph K. Mertzweiller, Baton Rouge, La. Upper left, Hybrid, 'Marie Goretti' x **A. evansiae**; upper right, picotee type from 'Nivalis' x 'Apple Blossom'; lower left, unidentified species Goedert SA 63-20; and lower right, 'Senorita' hybrid, 17 blooms open on 4 bulbs in 10-inch pot.

pods the parent bulb remained dormant until the spring of 1967. It appears to be a rather weak grower.

A. yungacensis (Cardenas and Nelson, PLANT LIFE, 1965) also bloomed within a few weeks after the bulb was received. This very striking species is noted for its bold color pattern in greenish white and red. One bloom was pollinated using pollen from another clone of *A. yungacensis* and the other was pollinated with pollen from *A. forgetii*. Both pods set and reasonable germination was obtained. The seedlings grew well during the summer and fall, and in March both groups of seedlings were re-potted to give them more room. Almost immediately all went dormant and remained dormant for several months until the pots were moved to a cooler, more shaded location. It is concluded from this experience that *A. yungacensis* and its F-1 hybrids do best when maintained under cool, somewhat shaded conditions. The parent bulb of *A. yungacensis* has shown fairly vigorous growth but it did not bloom in 1967.

A. forgetii was received at the same time as *A. yungacensis*, but has not yet bloomed for me. It is an extremely vigorous grower. Probably the reason for its failure to bloom is that it did not get a thoroughly dry rest period. This fall I plan to withhold water completely from both *A. forgetii* and *A. yungacensis.*

A. pseudopardina is another species which has not bloomed and has been somewhat of a disappointment. The bulb made good growth and three offsets in two years and had become crowded in the pot. In May, 1967 the main bulb was re-potted and the three offsets planted in another pot. Two of the offset rotted almost immediately. At present the original bulb and the remaining offset are showing new growth. It appears that the culture I have provided is not right for this species. If reasonable growth is made prior to late fall I plan to subject it to a dry rest period.

With respect to *A. pseudopardina (= A. leopoldii)* I have a few comments I wish to offer. In 1964 I obtained from Mr. Goedert a blooming size amaryllis bulb under the name 'leopardina hybrid', the name inferring the possibility of it being a hybrid of *A. leopoldii* and *A. pardina.* I believe Mr. Goedert obtained these bulbs from Hawaii. Of course there is no guarantee that the proposed parentage for this hybrid is correct. This amaryllis has bloomed very consistently in pot culture. It is fairly large, about seven inches across, very regular in form and with white throat markings not inconsistent with an F-1 hybrid of a species fitting the AMARYLLIS MANUAL description of *A. leopoldii.* It has been my intention to ''breed back'' by repeated self pollination. Unfortunately no seed could be obtained. Early in 1967, while the bulb was still dormant, I took it out of the pot and planted it in an outdoor bed. It bloomed in April and seed was obtained by selfing. A dozen seedlings are now growing. It will probably be three or more years before these seedlings bloom, and it will be very interesting to see if there are types resembling *A. pesudopardina* or the originally described *A. leopoldii.*

Two other species, *A. umabisana* and *A. mollevillquensis* have not bloomed. They do not grow well in the humid climate of south Louisiana, but are holding their own. *A. umabisana* has two large blue-green leaves and *A. mollevillquensis* has only one leaf at this time. These species are native to high elevations where the climate is cool and dry and it is a great challenge to try to grow them under Louisiana conditions. If they can be induced to bloom but one time it may be possible to cross them with other species or hybrids better adapted to a humid climate and thus introduce new characteristics.

An interesting F-1 hybrid which is proving useful in my breeding program is derived from *A. belladonna* (var. belladonna) X *A. striata* (probably var. fulgida). The plant was obtained as a seedling bulb from Prof. Davis several years ago. Flowers show typical *belladonna* form, are orange red in color and about six inches across. This hybrid sets seed very readily. I have seen many seedlings raised by Prof. Davis from crosses of this hybrid with Dutch clones. The most notable features are (1) very vigorous growth and (2) plentiful offset formation. Some of my own two year old seedlings are the most vigorous growers in my outdoor planting.

A hybrid which bloomed for me for the first time in 1967 was derived from 'Marie Goretti' X (*A. evansiae* x *A. pardina*). The pollen was given to me by the late Prof. Nelson in 1964. Only four seedlings were obtained. In pot culture these vary from very vigorous to almost totally lacking in vigor. The most vigorous plant produced a three flowered scape, leopoldii-type flowers, about seven inches across with nicely ruffled edges. The ground color is light pink with a lacy network of orange veining. Texture and substance are outstanding; in bright light the blooms show a diamond-like sparkle. This hybrid is considered encouraging evidence that beautiful and different varieties can be produced by use of the species or F-1 hybrids with the white Dutch hybrids and is pictured in Figure 17. No seed was set in 1967.

Regarding the white Dutch hybrids, these are a very highly inbred group and may be regarded as species in crossing with other species or even with other Dutch hybrids. A cross made many years ago 'Nivalis' X 'Apple Blossom', was repeated in 1964 and several of these seedlings bloomed in 1967. These were very similar to the earlier progeny from this cross. All are large, full leopoldii types. The base color is white. About 60% have a distinctive picote edge. All have red line or red spotted markings, or both, varying from very slight to fairly pronounced. As a group they are very vigorous growers and very dependable bloomers. One of the more pronounced picote types is shown in Figure 17.

Another group of hybrids showing promising performance in outdoor culture was obtained by using the pollen of *A. striata* (var. *fulgida*, light salmon pink in color) on the white Dutch hybrid 'Marie Goretti'. Five seedlings bloomed in 1967. All were very similar, five to six inch flowers, salmon pink ground color with some orange veining and green throats. Each bulb has produced five or six offsets. I consider these among the best "different" amaryllis for outdoor culture on the basis of their initial performance.

Finally I would like to offer a few comments on some of the unidentified species imported by Mr. Goedert. I have previously mentioned the species I obtained under number SA 63-20 (PLANT LIFE, 1967). A picture of this species is shown in Figure 17. I consider it to be a form of *A. belladonna* because of its growth habits and capitate stigma. It is the most dependable bloomer among those I have obtained from Mr. Goedert. Selfed seedlings of SA 63-20 are three years old and are growing very slowly and are at least two years from blooming size. Blooming of these selfs should determine whether SA 63-20 is a true species or a natural hybrid. Many seedlings from SA 63-20 X (*A. evansiae* x *A. aglaiae*) should bloom in 1968. Seedlings from 'Royal Dutch' X SA 63-20 are perhaps two years from bloom. Several attempts have been made using the pollen of white Dutch hybrids on SA 63-20. Seed pods were always obtained, but the seed were always devoid of embryos. This past spring I obtained a good crop of seedlings from the cross SA 63-20 X *A. cybister*. The original bulb of SA 63-20 rotted after maturing seed pods this year, but two offsets and the selfed seedlings remain.

Species SA 63-22 has bloomed for the past two seasons and this is definitely a form of *A. striata* (probably var. *striata*). Another species, said to be *A. striata* (var. *acuminata*), also blooms well. I can detect very little if any differences between these two plants. A large number of seedlings were obtained by crossing these two.

Unidentified species which have not bloomed include SA 62-1, SA 62-5, SA 63-10, SA 63-16, LM 63-1 and one said to be *A. maracasa.*

HYBRIDIZING WITH AMARYLLIS SPECIES

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In recent years there has been a return to growing and hybridizing amaryllis species and first-generation hybrids as reported by Nelson (1955, 1960), Smith (1961), Morris (1964), Fesmire (1967) and many others. In view of the many, very beautiful hybrids that are readily available, there must be logical reasons for working with species. The reasons seem clear. (1) New species have been discovered which can add new and distinctive characteristics to the present hybrids. (2) Quite a few previously discovered species, which have been lost to cultivation, have been reintroduced. (3) It seems probable that the presently available species can be combined to produce new and significantly different types either in form, color, color pattern or size. (4) In creating new types, *being able to leave out some species,* with dominant characteristics which went into the first hybrids, may be almost as important as which species are included in the new hybrids.

Since the availability of species (especially to the amateur) is almost completely dependent on others, it seems proper to give credit to the persons and organizations that have been largely responsible for my progress thus far.

1. Probably the late Prof. Ira S. Nelson at the University of Southwestern Louisiana helped to initiate this latest surge in species hybridizing in connection with the Louisiana Society for Horticultural Research and as a result of his collecting trips to South America in 1954 and 1958. Three new species were discovered (one jointly with Dr. Martin Cardenas), several previously described species were reintroduced, and a number of species and F1 hybrids were made available through the Louisiana Society for Horticultural Research.

2. More recently Dr. Martin Cardenas (Herbert Medalist for 1967) of Cochabomba has collected and Prof. Claude W. Davis of Baton Rouge has imported and distributed a number of Bolivian species which hold great promise to the hybridizer (Davis, 1967).

3. Recently, also, Mr. Robert Goedert (Herbert Medalist for 1965) has imported and distributed a number of unidentified species collected for him in South America.

4. Also, other individual efforts have been most helpful. Prof. Davis has propagated releases from the Louisiana Society for Horticultural Research and also made further crosses with these species or varieties and made these plants widely available. Further, there has been a considerable exchange of plants and pollen between individuals and I feel that this should be encouraged as suggested by Mr. Fesmire (1967).

In the discussion of the individual crosses below, the cross will be identified followed by the year (in parentheses) that the cross was made and in turn (second parentheses) by the number of seedlings now growing (July, 1967). An attempt will be made to discuss consecutively those crosses where a common objective exists or where the species are closely related.

THE QUEST FOR YELLOW HYBRIDS

Many hybridizers are working toward yellow hybrids both in large (leopoldii) and miniature (gracilis) sizes. As will be indicated in later descriptions, one fallout from this effort may be light pink or pink and yellow hybrids which will also extend the color range of present-day hybrids.

Some seedlings from crosses of *A. evansiae* X white dutch described by Nelson (1960) are pink but as pointed out this color probably is genetically unstable since it originated from light yellow and white. Pollen from one of these seedlings was used with 'Maria Goretti' (1965) (30) and 'Winter Carnival' (1965) (15). When these seedlings bloom, many possibilities exist for selfing and sibling the best individuals.

One clone of (*A. evansiae* X *A. aglaiae*) X *A. evansiae* is pale yellow in color and frequently has four florets per scape. One of its siblings (sterile as a pod parent thus far) has a similar pale yellow background but also has many tiny reddish-orange veins giving an orange-pink appearance from a few feet away. A clone of *A. evansiae* X (*A. evansiae* X *A. belladonna*) is a pink-yellow bicolor with predominantly light pink petsegs and predominantly pale yellow setsegs. As is frequently the case with the progeny of *A. evansiae,* their colors defy adequate description. The following crosses have been made.

(1) [(*A. evansiae* X *A. aglaiae*) X *A. evansiae*] X 'Maria Goretti' (1966)(11). The reverse cross failed.

(2) [(*A. evansiae* X *A. aglaiae*) X *A. evansiae*] X Sib (1966)(9).

(3) [(*A. evansiae* X *A. aglaiae*) X *A. evansiae*] X [*A. evansiae* X (*A. evansiae* X *A. belladonna*)] (1966)(15).

(4) 'Maria Goretti' X [*A. evansiae* X (*A. evansiae* X *A. belladonna*)] (1966)(24).

Another interesting hybrid known as 'Morris Yellow' is from an unrecorded cross made by Mrs. Lloyd Morris of Baton Rouge. One parent may be either *A. evansiae* or 'Senorita' (*A. evansiae* X *A. striata*) and the other parent either 'Nivalis' or 'White Giant'. The 5½ inch florets (four per scape) are full and fairly flat with a slight upward tilt. The color is pale yellow with darker yellow highlights starting in the throat and extending out into the center of the segments and with pale pink lines radiating out from the inner parts of the segments. The following crosses have been made.

(1) 'Maria Goretti' X 'Morris Yellow' (1966) (18).
Reciprocal (1967)(8).

(2) 'Nivalis' X 'Morris Yellow' (1966 and 1967)(58).
Reciprocal (1967)(15).

'Morris Yellow' has also been used as the pollen parent with the following: 'Senorita' (1966)(3); 'Pamela' (1966)(25); a clone from an orange *reginae* hybrid X 'Senorita' (1966) (10); a white gracilis (1967) (7); *A. belladonna major* (1967) (4) and a pink-orange form of *A. striata* (1967) (12).

A clone of [*A. evansiae* X (*A. evansiae* X *A. aglaiae*)] X [(*A. evansiae* X White Dutch) X sib] is an intermediate sized, pink blush on white with a yellow star in the center. It has been used as the pollen parent in 1967 with 'Maria Goretti' (10 seedlings), 'Nivalis' (12), 'Senorita' (2), and the pink-orange form of *A. striata* (25).

In addition to the above and the crosses with 'Senorita' described below, about 200 other seedlings related in some way to *A. evansiae* are in various stages of growth. It is impossible to guess which of these may be most likely to aid in producing yellow amaryllis.

HYBRIDIZING WITH SENORITA

Almost everyone who has written about 'Senorita' has pointed out that words and even pictures fail to adequately describe the beauty of this lovely group of flowers. (Fig. 18) This combined with their vigorous growth and easy blooming seem to strongly recommend 'Senorita' as a parent. Depending on the choice of the other parent, either small or large-flowered hybrids appear possible. 'Senorita' sets seed sparingly, usually on the first one or two florets (out of four) per scape and generally produces 8 to 20 seed about one-half of which are viable. This may vary from one clone of 'Senorita' to another. Using

'Senorita' as the pod parent, three to eight seedlings are in various stages of growth (many very vigorous) from crosses with the following pollen parents: 'Prima Donna', 'Rosaline', 'Golden Triumphator', 'Maria Goretti', 'Picotee Petticoat', 'Constant Comment' and a white gracilis. A plant of 'Senorita' X 'Apple Blossom' has bloomed. It is intermediate in size and has a very light pink background contrasted with a bright green throat and with darker pink lines radiating outward on the segments. It has been crossed with several white dutch hybrids.

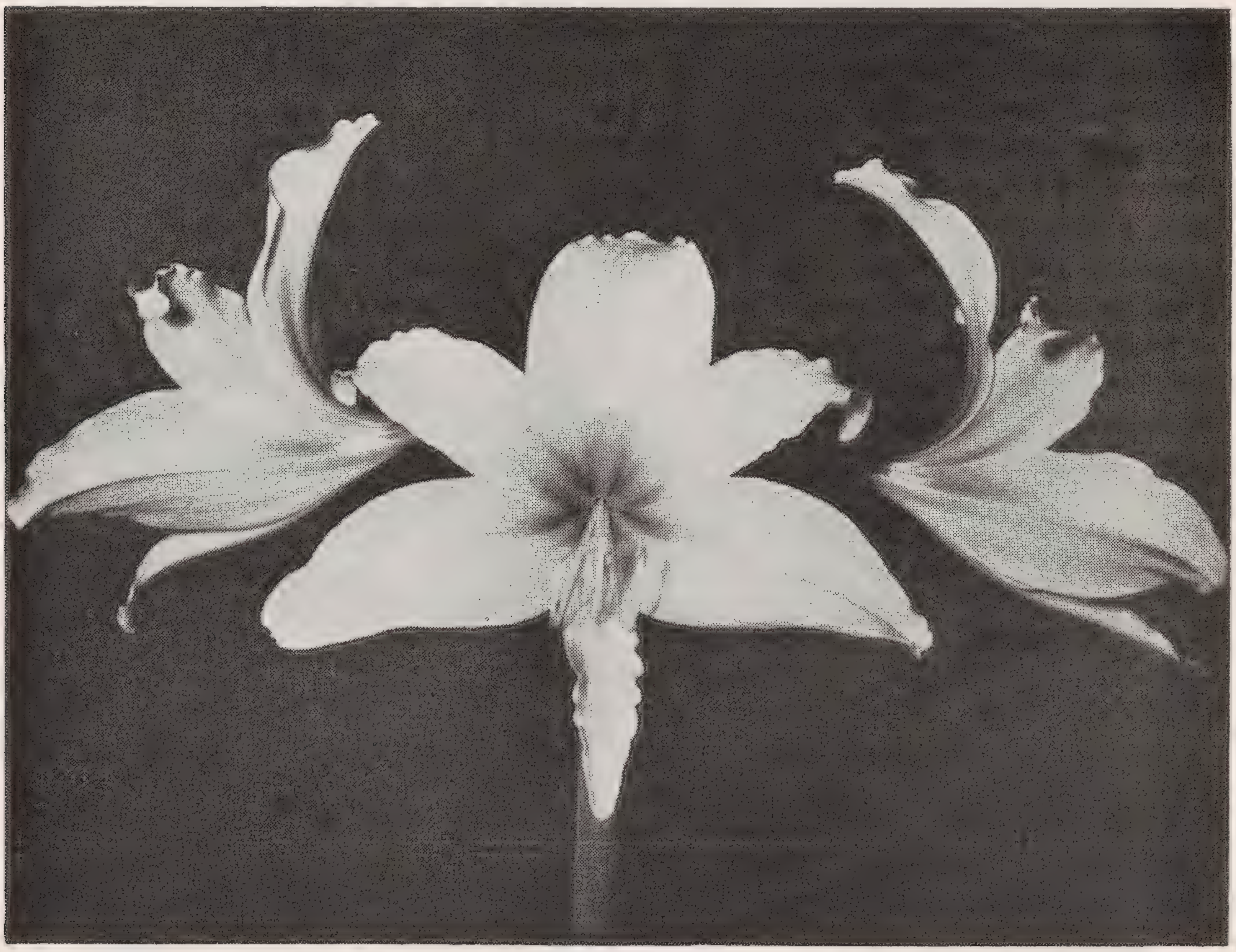

Fig. 18. **Amaryllis** hybrid, 'Senorita' as grown by Fred J. Buchmann, Baton Rouge, La.

The pollen from 'Senorita' sets viable seed easily on a wide variety of both leopoldii and gracilis hybrids. One seedling that is especially interesting is from a cross of 'Constant Comment' X 'Senorita.' (Fig. 19) The gracilis type flowers are light pink shading to tomato red at the outer edges of the segments. However, the most outstanding feature is a dark yellow band (1/4 to 3/8 inch wide) extending from the throat about one-third of the length of each of the top three segments. Each band is surrounded by an area about 1/4 inch wide of darker reddish-orange, much darker than the background color. This gives an appearance similar to that of the "eye" in some clones of hemerocallis. Possibly this "eye" can be improved and passed on to other colors and sizes of amaryllis. This eyed-clone was the pod parent for a cross with 'Morris Yellow' (1967) (20).

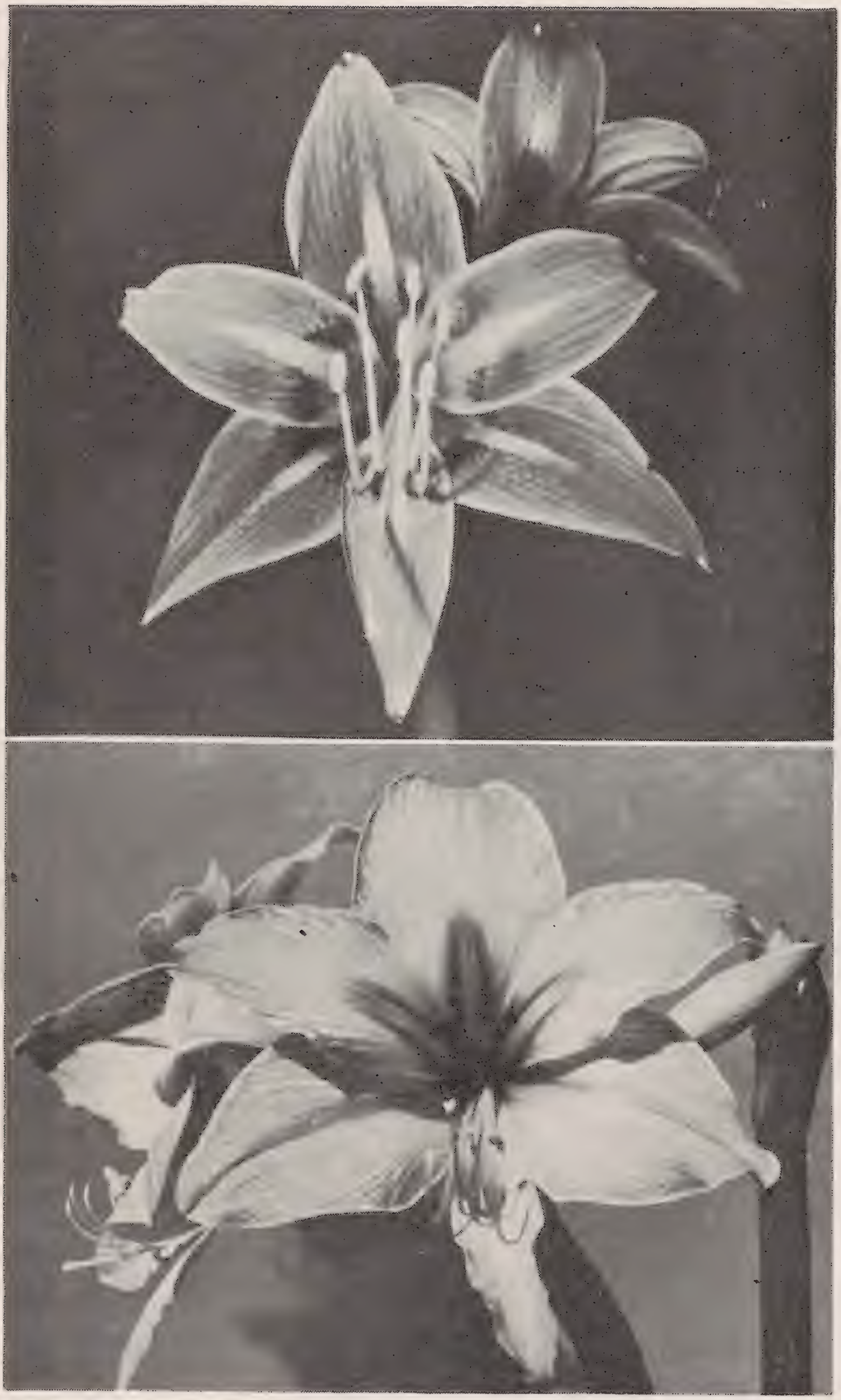

Fig. 19. **Amaryllis** grown by Fred J. Buchmann, Baton Rouge, La. Upper, **Amaryllis forgetii** (Worsley) Traub & Uphof, and lower, eyed clone from a cross of 'Constant Comment' and 'Senorita'.

A. FORGETII, A. YUNGACENSIS, A. AULICA

A. forgetii has been a real joy. It was received on January 8, 1966 and bloomed on March 20, 1966. (Fig. 19) It was kept watered and bloomed again on December 10, 1966. It is not clear whether this latter date will be more nearly its normal blooming time. Pollen from *A. forgetii* set seed on *A. aulica* (var. *stenopetala*?) (30 vigorous seedlings) and also on *A. yungacensis.* This latter cross was made by Joseph Mertzweiller of Baton Rouge and also gave vigorous seedlings. However, all other attempts to use *A. forgetii* pollen were unsuccessful on species, either in the *striata* or *belladonna* groups, dutch hybrids or *gracilis* (all known to set seed easily). On the other hand, *A. forgetii* set seed each time it was pollenated. On December 10 no other fresh pollen was available, so it was selfed and ten not so vigorous seedlings are just now putting on their second leaves; they appeared to go dormant after putting on the first leaf. From the March blooming, eight vigorous seedlings resulted from mixed pollen of 'Maria Goretti' and 'Christmas Gift' (the reverse cross with 'Maria Goretti' failed) and about 40 somewhat slower growing seedlings resulted from mixed pollen of *A. striata, A. evansiae* and *A. yungacensis.* In this latter cross it was hoped that three groups of seedlings would be produced. However, careful examination of the seedlings (now about one year old) suggests that fertilization occurred with pollen from only one species. In view of the incompatibilities indicated above for *A. forgetii* pollen, this cross may be from the *A. yungacensis* pollen and be the reciprocal of the cross made by Joseph Mertzweiller. My experience with pollen from *A. yungacensis* has been similar thus far; no seed have resulted with either species in the *striata* and *belladonna* groups or with known seed-setting dutch hybrids with one exception. A small pod was set on 'White Christmas' (1966) and four seedlings are growing moderately well. Crosses failed with 'Nivalis and 'Maria Goretti' which set seed very consistently.

The implication is that the *Aulica* group is somewhat further removed from the *striata* and *belladonna* groups and also from white dutch hybrids than either of these latter three are from each other. It will be interesting to see if further crosses bear out this implication. Also, it will be interesting to see if the above hybrids involving *A. forgetii, A. aulica, A. yungacensis* and white dutch will produce large, full flowers with four florets per scape. They should be in various combinations of red, white and green and bloom at Christmas time. Because of this potential blooming (and probably growing) time, these hybrids will have to be handled as pot plants in the Baton Rouge area but should do well in areas with a warmer winter climate.

AMARYLLIS PSEUDOPARDINA

A. pseudopardina (*A. leopoldii*—see Plant Life, vol. 21, pages 55-57 and 60-63) has been a horticultural success but a disappointment in hybridizing. Received in October, 1964, it has grown vigorously and bloomed twice. However, as a pod parent no viable seed have been set with mixed pollen from species in the striata and belladonna groups and from white leopoldii hybrids. Pollen from *A. pseudopardina* was used on everything available—species (again in the striata and belladonna groups), various leopoldii hybrids and several striped "yard flowers" in the reginae division. Result—no seed. If this species should bloom again next year and other plants cooperate, crosses will be attempted with species in the aulica group.

SUMMER-FLOWERING AMARYLLIS

This is an area where absolutely no success has been achieved. *A. aulica* var. *platypetala,* a plant obtained as *A. correiensis* and a plant obtained as *Amaryllis* X *acramanii* all bloomed in July, 1966, but I was unable to get any seed to set.

AMARYLLIS STARKII

A. starkii appears to hold considerable promise for producing pastel, miniature hybrids. Three seed pods have been set resulting in about 100 seedlings. Mixed pollen was used in all cases and involved *A. striata,* (*A. evansiae* X *A. aglaiae*) X *A. evansiae, A. belladonna major,* two tiny *A. belladonna* hybrids, 'Senorita', a white gracilis and 'Daintiness'.

UNIDENTIFIED SOUTH AMERICAN SPECIES

An interesting experience occurred in the Spring of 1967 in connection with bulbs imported by Mr. Goedert. Bulbs designated as SA 62-3 and SA 63-16 bloomed about two weeks apart for the first time. They appeared to be the same species but do not fit the description given by the collector for either. They are fairly close to *A. espiritensis* and could possibly be this species. Neither of these set seed to self pollenation but a cross was obtained of SA 63-16 X SA 62-3 and 30 tiny seedlings are now growing slowly.

AMARYLLIS STRIATA

Several forms of *A. striata* are being grown and cross easily with large-flowered hybrids giving very vigorous seedlings. In those that have bloomed thus far, the striata color pattern is strongly dominant and I have been told that this probably will be true for several future generations. Lack of space prevents any very large effort in this direction.

AMARYLLIS BELLADONNA

The Bolivian form of *A. belladonna* collected by Prof. Nelson has many desirable characteristics. It is vigorous, persists when mulched outdoors during our very wet and sometimes cold winters (which none of the forms of *A. striata* will do), blooms easily with four florets per scape and sets seed readily. It has been crossed with leopoldii hybrids and their progeny are being selfed to see if this is a reasonable route to small flowered hybrids in pastel colors. A rose pink form of *A. bella-*

donna collected by Prof. Nelson in 1958 has given a number of light pink hybrids and pollen from some of these has been used with a number of pod parents hoping for light pink in both large and small sizes.

WHAT NEXT?

The plants already growing should provide a seemingly unending succession of potential self pollenations, sib crosses, back crosses and even out crosses. However, there are two other areas which are most inviting.

1. *Long Trumpet Hybrids. A. fragrantissima* is growing well and it probably will bloom in 1968. Hopefully, pollen will be available from some suitable long trumpet species when this happens. However, a plant indicated to be *A. elegans* is growing slowly and appears to need several years yet before flowering *A. umabisana* is barely existing and may never bloom in Baton Rouge; Dr. Cardenas has reported that it has failed to bloom even in Cochabomba.
2. *Orchid-Flowered Hybrids. A. cybister* and a plant thought to be *A. maracasa* have just about finished reversing their growing seasons and may bloom in a year or two. Possibly other species with tendencies toward orchid-type flowers can be added.

So, growing and hybridizing amaryllis species is a very enthralling avocation. Don't let anyone kid you, there is a moderate amount of hard work involved but the results are more than amply rewarding.

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In a previous article, the writer mentioned that he was constructing benches with plastic hoods over them, intending to grow his potted bulbs upon these benches. A year of use has confirmed their value. A check of the bulbs this past spring revealed scarcely a trace of the red virus disease which was so prevalent the previous spring, and most of the seedlings continued to grow slowly all through the winter months. In fact, bulbs of all sizes displayed better growth this past year than ever before, and the credit for this must be given partly to the protection offered by these hoods from rainfall and the condensation on cold nights, and partly to a program of continual feeding. Every time the bulbs are watered (except during the winter months), they are watered with a weak solution of a soluble fertilizer, such as Fish Emulsion. This program of feeding was adopted after observing the results of its use at a commercial garden nearby, and it paid dividends this spring in the finest blooms the writer has yet had.

The last bulbs of two crosses made between the Houdyshel orange-scarlet hybrids and *A. striata fulgida,* using each as the seed parent, bloomed this past spring, and some observations can be recorded. In the first place, a marked difference in hardiness between the two crosses has become apparent. The hybrids having *A. striata* for the seed parent are very tender; they lose their leaves in the fall, and are prone to decay during the winter months if kept outside. But the hybrids having the Houdyshel Hybrid as the seed parent are quite hardy; the leaves are dark green with a heavy texture, and remain green all winter. In the second place, these evergreen hybrids have much more attractive flowers than the others, being of the Reginae type but only four to five inches in size. In color, they are a salmon orange fading to rose with a touch of green on the reverse side. Thus it paid to make this cross both ways, since one cross was so much superior to the other one. However, the only one showing a recurrent blooming tendency was from the tender cross. This year, a number of very interesting crosses were made with these flowers, including crosses with a *belladonna* X *evansiae* Hybrid, a *vittata* X Dutch hybrid, and with the Peruvian miniature hybrids.

Another example of the value of making a cross both ways can be given, for two crosses between an Indian miniature hybrid and *A. striata fulgida* also gave quite different results. In this case the hybrids having *A. striata* as the seed parent are the ones that are doing very well, being evergreen, while those having the Indian miniature as the seed parent are doing very poorly, several bulbs having decayed completely this past winter. However, after observing some twenty *striata* crosses, it can be concluded that crosses with *A. striata* as the pollen parent will usually be much more vigorous in growth than those using *A. striata* as the seed parent. Typical of many *striata* hybrids having had *A. striata* as the seed bearer is a cross between *A. striata fulgida* and *Skildway,* made by a friend in Pasadena; when kept inside it grows vigorously all winter but when kept outside it goes dormant until spring, and even then grows rather poorly. The species *A. striata* and many of its hybrids seem to require considerable heat at all times for successful growth.

One of the writer's first *A. striata* crosses was between *A. striata fulgida* and a rose-colored South African hybrid. The resulting hybrids were in all shades of pink with flowers averaging 5½″ in diameter, but were very sensitive to any low temperatures, definitely requiring greenhouse care. However, one of these pinks was self-pollinated, and the resulting seedlings have grown quite vigorously here in California, even though kept outside all winter with temperatures close to freezing on some nights. These should bloom very soon, and the first flowers are being eagerly awaited. Another of these pink hybrids was crossed with a Van Meeuwen white Dutch hybrid, and the first bulb of this cross recently bloomed, producing quite a surprise. The flowers were not a pink in color, but a pale red, edged in darker red, and with a wide streak of pale lavender through the center of each tepalseg. This flower was crossed with a Ludwig recurrent-blooming white Dutch hybrid and with a salmon blend from Van Tubergen.

A number of other *A. striata* crosses with interesting possibilities are also doing very well outside here, but have not yet reached blooming size. Among these are crosses with both Peruvian and Indian miniature hybrids and also with larger types. One cross of particular interest was between a Houdyshel-Dutch hybrid and a miniature form of *A. striata* from Hawaii; the resulting plants are evidently going to be true miniatures, although they are growing very slowly.

In the spring of 1962, a cross was made between the Houdyshel orange-scarlet hybrid and an unnamed Ludwig pink Dutch. The resulting hybrids have been close to my ideal of a ''window sill'' *Amaryllis.* They are vigorous in growth, with rather short, wide, deep green leaves which remain evergreen until new growth appears in the spring, even when kept outside all winter. The flowers, averaging 6″ in diameter, have been beautiful both in shape and color. The tepalsegs are wide, overlapping, slightly reflexed, and of very heavy substance. The colors have varied from light salmon pink through dark rose to a light red and also white marked with red; a touch of green in the throat and on the reverse adds to their beauty. The scapes, from 14″ to 19″ in height, have carried three or four flowers. Unfortunately, these hybrids have not displayed any recurrent-blooming tendency, but they have been crossed with several *striata* hybrids, and with a recurrent-blooming Peruvian miniature. The first of these crosses should soon bloom.

The Peruvian miniature hybrids mentioned here were raised from seed purchased from R. D. Goedert. Although some of the plants became a little too large to be classified as true miniatures, they are very satisfactory, since they have wide, evergreen leaves and well-formed flowers about 4½″ in diameter of either red or white marked with red. These have also been used considerably in the writer's breeding program. One such cross with the Houdyshel orange-scarlet hybrid has produced seedlings with dark, gray-green leaves of extremely heavy texture, which apparently are evergreen and more tolerant of low temperatures than any other seedlings being raised by the writer. Since all of his seedlings are being raised outside, he has come to realize that the factor of hardiness in the modern hybrid Amaryllis needs more emphasis; and so this has become another of his goals.

It has been suggested that if new flower forms and colors are to be introduced into the Amaryllis hybrids, it will be necessary to utilize in our breeding programs some of the more-recently discovered species. If so, there may be something new appear eventually here in Southern California, since many members of the Southern California Hemerocallis and Amaryllis Society are now engaged in hybridizing activities, and many of these newer Amaryllis species can be found here in various collections. The writer is cooperating with a member in Long Beach in a project to build up a species collection that can be used in breeding work, and many additional species, primarily in the form of seedlings or small bulbs, have been added to this collection the past year, including two yellow-flowered species from Argentina. Some of these acquisitions represent species not yet identified, and were received directly from a friend in South America; it is anticipated that more new species will be received from this same source. Pollen of various species was also received from this friend, but most attempts to use it were unsuccessful, although two crosses were successful. In addition, seeds from a number of direct crosses with such newer species as *A. forgetii, A. starkii, A. evansiae,* and *A. cybister,* have been received from fellow members of our local society. Crosses with the 'Senorita' hybrids are not often successful, but last year one cross, using the 'Senorita' pollen on a Striata hybrid, was successful for the writer. This year, a friend has secured several successful crosses between Dutch hybrids and a 'Senorita' hybrid. Likewise, several crosses have apparently been successful using pollen from a Calyptrata hybrid.

One of the writer's goals is to develop a group of summer and fall-blooming hybrids, and finally a start has been made on this project. When his *A. aulica* X 'Floriade' hybrid bloomed in July of 1965, all crosses with it resulted in failure, but when it bloomed in July of 1966, all crosses using its pollen were successful, although no seed would set on the bulb itself. A flower scape is now coming on this bulb again, and when it blooms in July, perhaps more crosses will be successful. Last year's successes at least furnished the encouragement to keep trying with these difficult hybrids.

An unidentified species received from a friend in Burbank has just bloomed. It has small, pale red flowers with a greenish yellow throat, and is evidently either an inferior form of *A. striata fulgida,* or else *A. striata,* var. *striata.* However, its value lies in the fact that it bloomed in July, and it is the only form of *A. striata* that wants to grow and bloom for the writer here in California. Most of his other varieties of *striata,* which grew fine in a greenhouse in Colorado, simply sulk here in California, even when kept in the house, probably because of the cool temperature along the coast.

Bulbs of *A. reticulata* and the hybrid 'Mrs. Garfield' have been obtained, and seeds or bulbs of several more Aulica crosses have been received from friends. One of these gifts has an interesting history: when the species LM63-1 bloomed last August, the writer could not use the pollen; so it was given to a friend, who in turn sent it on to another friend in South Carolina, who used it successfully in a cross with *A. aulica.* And recently, to complete the circle, a small bulb of this cross finally arrived for the writer.

EXPERIENCES WITH AMARYLLIDS

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General. My experimental programs with Amaryllids are limited in scope to suit a restricted time availability. I have nevertheless tried to make meaningful progress with small facilities in a small space. In my study there are two commercially available small plastic greenhouses, with thermostatically controlled bottom heat, under 24-inch double-lamp Gro-Lux fixtures. In the garage there are two home-made plastic-sheeted greenhouses with controlled bottom heat and Gro-Lux lighting. To the southeast of the house is a home-made A-frame with controlled bottom heat available, and with hinged roof panels of framed hardware cloth which can be covered with solid sheeting or woven shade cloth according to the season. In other areas of the yard there are flush and raised beds, pockets and corners, pots and tubs, and a coldframe with hinged cover panels. The basic essential element is an understanding and helpful wife.

Basic Program. The long range program is composed of four coordinated lesser programs, each adaptable enough to follow the trend and pace of overall results and specific advances. No. 1 is aimed at development of a strain of hybrid Amaryllis to serve as a basic breeding stock. The characteristics sought are high seed production, high germination rate, high survival rate under adverse growing conditions, fast maturation, repeat flowering, disease resistance and—as a bonus—*fragrance.* No. 2 is the development of optimum procedures for controlling flower production, affecting crosses, germination of seeds, seedling survival and accelerated maturation. No. 3 is the development of optimum procedures for making bi-generic crosses. No. 4 is the investigation of special techniques of chemical, gas and electrical treatment of seeds, plants and bulbs.

Breeding Stock. The source ''mother'' was a common backyard hybrid Amaryllis selected because it survives the standard types of mistreatment exercised by the average homeowner in this area. It is evergreen, flowers readily, sets seed readily, and resists disease. It has survived the digging and replanting that goes along with gardeners' irrepressible generosity with mediocre plants, seems to thrive in almost any type of soil or drainage or exposure, and multiplies rapidly. It has the basic *Amaryllis leopoldii—A. vittata* blend of characteristics and coloration. Onto this was crossed a hybrid Amaryllis of Japanese origin which had a pure white blossom with a limited amount of green in the throat, had a graceful shape approaching that of *A. belladonna* on a tall, slender, straight scape, and was *sweetly fragrant.* This white parent would not set the reverse cross, and did not survive its first winter outdoors.

Also crossed onto the mother plant was a large, brilliant orange-red unnamed hybrid Amaryllis with a flat-faced perigone of round-tipped petals with a heavy, coarse texture. Its throat was a deeper red, with almost no green. Since a cut scape was used, no reverse cross was tried. From the seedlings of these two crosses, selections have been made of the more desirable combinations of characteristics. Of a few hundred seedlings, thus far twenty-two first generation plants have been selected as breeding stock. Some of this original batch, from crosses made in 1960, have not flowered yet. However, in spite of this slow maturation, they will all be kept growing on until they flower because some of the best did not flower until 1966 and 1967. Those which were the earliest to produce strong flowers were crossed, regardless of other characteristics. From these there were several which produced very strong flower scapes early in the third year. Of these only four have so far been adjudged worth preserving. On some of those four, because of their vigor and early maturation, bi-generic crosses were tried. These specimens and some of the first generation specimens displayed marked differences in their useability as parents for bi-generic crosses.

Growing Procedures Developed. The only particularly special procedure has been the use of deep plastic juice pitchers instead of clay pots. The number of control specimens is small, which results in certain reservations regarding the reliability of the data which were recorded. My primarily subjective judgment, based on leaf production, increase in bulb size and root condition, is that the deep containers are generally better. Furthermore, those which matured and flowered first were in the deep pitchers. In both the plastic pitchers, in the standard square plastic pots and in the standard clay pots I start with a layer of ¾ inch crushed rock, then the roots of the plant in a generally used soil about one inch from the rim. Fine sand is sprinkled around and under the base of the bulb and gently packed in. Then quarter-inch crushed rock fills the pot to the rim. There is a reduced incidence of red spot and rotting during the cold, wet season, far below that of bulbs planted deeper in the soil mix. Best germination has been achieved from seeds whose black papery covering has been carefully peeled off before sowing. Seeds thus peeled are laid flat in shallow drills in dampened Terralite which is about two inches thick over a four-inch deep base of half potting mix, half Terralite. The smaller seedlings are grown in a greenhouse under Gro-Lux lights controlled for 16 hours of light, with continuous bottom heat of 70 to 80 degrees F.

Bi-Generic Crosses. Reports will be made as these come into flower.

Special Techniques. When seeds are soaked in colchicine solution, my criterion for ''too long'' is stunted root growth. By soaking a large batch of seeds, of which a specified number is planted each succeeding day, I derive my private optimum soak times for the different kinds of seeds. For hybrid Amaryllis, less than 24 hours seems to have had little effect on the resultant plants, and more than 48 hours has resulted invariably in plants which dwindled and died. Rubbing a mixture of lanolin and colchicine has not yet been successfully done on any of the plants on which it was tried; all seed pods softened and withered. I have not had any success with rubbing a mixture of lanolin and naphthalene-acetamide into scarfed or scratched seed pods to make them hang on and mature. Spraying foliage with commercially available gibberellic acid in aerosol containers has had no noticeable effect on any of the Amaryllids. Injection of gibberellic acid (sprayed from the can into a glass and permitted to evaporate for several hours) into resting hybrid Amaryllis bulbs by hypodermic syringe started leaf growth in advance of untreated bulbs, but this seemed to deter their flowering. Exposure of hybrid Amaryllis foliage to carbon monoxide wilted the foliage immediately, but in a few weeks new leaf growth was vigorous and on several plants so treated there was vigorous flower stalk production along with new leaf growth. Exposure of foliage to ethylene gas stimulated flower stalk production, which was useful in bringing selected plants into flower out of their regular season. Passing electrical current through plants has not yet produced any noticeable change; variations of voltage and amperage combinations may be tried later.

Miscellaneous Observations and Random Musings. One *Amaryllis striata* flower in an umbel of three had four parts instead of six; it set no seed when selfed. My experience verifies that reported by other Amaryllid growers: *Chlidanthus fragrans* is reluctant to flower. One of my first generation hybrid Amaryllis seedlings had an umbel of closely grouped flowers of almost equal length tepalsegs which faced nearly upright in the manner of *Brunsvigia rosea.* The stigma did not recurve its styles when mature; and the plant rotted during the cold, wet season. This, plus the way that seedlings can be grouped into sets of almost identical characteristic combinations, raises some interesting conjecture about the lineage of the plain old garden variety of local Amaryllis plants: by careful selection, could one cause a reversion to the individual species types which had a part in the development of our present-day ''hybrid''? Growing *Narcissus* from seeds has been rewarding. 'King Alfred' sets seed readily, and 'Soleil d'Or' sets seed occasionally. If a new batch of seed is sown each year, after the fourth year there is a constant procession of distinctly varying flowers each spring. I have no outstanding ones, but several have been good enough to name unofficially after our grandchildren so that each will have his ''own'' Daffodil. *Tristogma uniflorum violaceum* (the exact identity is questionable) is an excellent source of easy-to-grow bright blue. With development for size, height and brightness of the blue tones, it could be a valuable addition to the color range of the Amaryllids.

1967 HEMEROCALLIS REPORT

W. Quinn Buck, *Chairman, Daylily Committee,*
American Plant Life Society

The year 1967 was full of the usual variations from the normal in weather and season in most parts of the country. On the West Coast our blooming season was generally much later than usual, and this was reflected in the lack of bloom in the Stockton, Calif., area, where the regional meeting for Region 7 of the American Hemerocallis Society was held at Melrose Gardens on June 10. In the evening the Northern California Hemerocallis Society held its annual meeting and dinner at the home of Jack S. Romine in Walnut Creek, following the afternoon garden tours. Mr. Romine had 'Tetra Forty-niner' in bloom in his greenhouse, as well as a chimeric clump of 'Alan' in the garden, both from his efforts at polyploidizing clonal material, and there were a number of very promising spikes on other treated plants. An unflowered treated plant of 'Cartwheels' was sending up a wonderful spike that seemed tetraploid and was the center of interest for certain people. The diploids in this garden also were much behind because of the cool weather, and few were yet in bloom.

On June 12th, on the return to Southern California, we were able to visit three very delightful gardens in Bakersfield, where their heat had done a good job of making the daylilies bloom well and normally. The first garden was that of Mrs. Beulah Stuteville, who had many of her own numbered seedlings in bloom, in addition to the new crop of seedlings and her collection of named varieties. There was a beautiful clump of her 'Peach Brocade', as well as her 'Summer Dream' and 'Red Tiger'. An especially promising seedling was S66-34 ('Flat Top' X 'Pres. Rice'), a flat, nicely shaped buff yellow; S66-339 was an eye-catching red. Plants of his R60-19 treated by Mr. Romine were growing in this garden, and they seemed to be tetraploid.

Mrs. Frances Kuhs was growing a number of varieties in large wooden tubs that could be shifted to take advantage of shade, the most spectacular being 'Raspberry Frills' (Williamson—1964) with its wonderful bright clean color and darker eye. Superbly grown also were 'July 4' (Wynne), an ryed red; 'Love That Pink' (Hall), a fine large pink of good shape; and 'Cherry Blossom' (Pittard), a very handsome darker pink.

Some of these same varieties appeared in the garden of Mrs. Donald McDonald, whose large collection left little room for her seedlings. Mrs. McDonald was testing a delightful group of sibling miniatures from Mrs. Olen W. Sheets of North Carolina, including 'Baron', 'Beth', and 'Thelma Griffin' ('Ringlets' x 'Fairy Wings'). The nicely shaped eyed 'Burlesque' (Lambert) was most attractive with its pie-crust edging. Another eye-catching variety from the same breeder was 'Trafalgar', a bright red which seemed to be enjoying the heat.

The Southern California Hemerocallis and Amaryllis Society had its annual daylily meeting at the Arboretum in Arcadia on June 17, with Mr. Robert J. Hixson, Jr., of Reedley, Calif., as the speaker. In the afternoon out-of-town visitors found much to look at in the Buck garden in Arcadia. Many tetraploid seedlings were at their height, and many named varieties were in good bloom. A colchicine-induced tetraploid form of 'Little Emily' (Hardy) attracted more attention than almost any other plant, perhaps because of the exciting possibilities it seemed to offer as a parent for tiny ruffled miniatures.

Now it can be reported that 'Tetra Little Emily' proved to be a very good pod parent and set many seed from a whole series of combinations with pinks, lavenders, eyeds, melons. Another colchicine-treated parent was the strongly eyed 'Borgia' (Wynne); it proved to be fertile in some very interesting crosses. Treated plants of 'Lady of Northbrook', 'Lavender Parade', 'Cartwheels', 'Blue Jay', 'Grace Lenington', 'Shining Plumage', 'Pink Venus', 'Petite Pink', and many others contributed to giving a fairly adequate seed crop in spite of almost no seed from some normally heavy seed setters. Among the new Buck seedlings some lavenders and purples aroused the most interest and gave the best possibilities for both treating and breeding. Prospects for lavenders and pinks from the new seed crop seem much better after getting to study the 1967 seedlings.

'Bonnie Barbara Allen' was the most satisfactory of Dr. Virginia Peck's five 1966 tetraploid releases, none of which set any pods here. The flowers from the Peck clones most of the time seemed to resent our climate. By contrast, the beautiful Fay clones, 'Kathleen Elsie Randall', 'Lady Cynthia', and 'Gertrude Smith', bloomed very satisfactorily from plants set out at approximately the same time as the Peck varieties. 'Lady Cynthia' set the most pods this season, but all three set pods and had fertile pollen.

Dr. Hamilton P. Traub's work is now entirely with medium height plants or miniatures. Many interesting new seedlings bloomed in his garden, despite the erratic season. His 'White Cloud' was released in August, and Dr. Traub's insistence on sun-fastness should make it an important clone in tetraploid breeding. It was developed by complex selective breeding over a number of generations, including 'Tetra Duchess of Windsor', 'Tetra Winged Victory', 'Magdalena Luethi', some near white tetraploid seedlings, and others. It carries huge, wide open flowers which may have slight coloring on the margins on opening and in the sun changes quickly to a wholly light color which is still at its best by the end of the day.

Among the diploids blooming for the first time in the Buck garden this year was the exquisite 'Prairie Melody' (Marsh), 'Diamond Anniversary' (Childs), 'Childscraft' (Childs), 'Marty Simon' (Simon), 'Eburnean' (Munson), and 'Sleeping Beauty' (Munson) were particularly beautiful this year. The new clone 'Marguerite Lloyd' (Lloyd), which will be released as soon as stock is sufficient, besides being an extremely beautiful eyed variety, has proven to be the most everblooming thing in the whole garden. Two miniatures to warm the heart were the wonderful pink 'Dreamlet' (Childs), and the bright, dark lavender-purple 'Little Wart' (Spalding).

Even bad seasons do not keep us daylily growers from having some things to enjoy!

"STAMEN-EMBRACING PETEPALSEGS" HERITABLE DEFECT IN HEMEROCALLIS

Hamilton P. Traub

Those who are engaged in *Hemerocallis* breeding have encountered a heritable defect which disfigures the flower. When present, one, two or all three of the petepalsegs become stiffly erect, each affected one embracing a stamen. This heritable character has been named "stamen-embracing petepalsegs", and it may occur in diploids and tetraploids. It was not considered seriously, until the notorious example of it in 'Crestwood Lucy' was encountered. In this example often most of its flowers are so disfigured. When used in breeding, the seedlings often inherit the defect.

The defect often occurs in seedlings with excellent color values which makes it necessary to try to eliminate it by crossing the defective plant with normal seedlings, and destroying that part of the progeny which shows the defect over a period of three or more generations.

It has not been determined if the defect is due to a single gene or to multiple genes. There is the puzzling situation in which the defect may disfigure part or all of a flower, part of the flowers or all the flowers on a scape. Sometimes all of the flowers are normal. It was also noted that plants which normally are not affected, sometimes may produce a flower or two which show the defect.

CHROMOSOME NUMBERS IN **HEMEROCALLIS WASHINGTONIA** "STATIC DWARF" PLANTS

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The basic chromosome number of *Hemerocallis* taxa is 11, with the cells of most species regularly having 22 somatic chromosomes, while the widely desseminated Europa daylily (*H. fulva*) has a 2n of 33 (Stout, 1932; Chandler, 1940; etc.). Traub (1949; 1951; 1959-60) using colchicine on hybrid *Hemerocallis* diploids (2n = 22), induced allotetraploids (2n = 44). He named this colchicine-induced species *Hemerocallis washingtonia.* In additional work Traub found (1967) that among seedlings of the tetraploids there were three groups: (1) about 99% are normal growing plants which are cross-fertile, and more or less self-fertile; (2) less than 1% are normal growing but cross-sterile; and, (3) less than 1% are slow-growing, delayed-flowering dwarfs. Dr. Traub has supplied us with several dozen seedling plants of the third group—the slow-growing plants which he has termed "static dwarfs." The present note offers a preliminary report on the somatic chromosome numbers encountered in root-tip cells of some of these dwarf plants.

OBSERVATIONS

In 1966 somatic chromosome counts were made or attempted with a number of plants. Exact numbers, or exact ranges of numbers, from these studies are presented for 9 plants, in Table 1. It may be noted that apparently one plant had 38, one plant had 44, 2 plants had 40, 3 plants had 42, and 2 plants had from 38 to 42 somatic chromosomes. As the study proceeded, however, it became increasingly evident that the number of chromosomes per plant probably fell within a definite range, rather than usually being an exact number. Accordingly, it was determined that in future studies attempts would be made to secure numbers, where possible, from a larger number of cells per plant.

Table 1. Chromosome numbers in some dwarf seedlings of **Hemerocallis washingtonia**, 1966.

Seedling number	2n	Seedling number	2n
H-1	42	H-7	44
H-2	40	H-9	40
H-4	38	H-12	42
H-5	38-42	H-13	42
H-6	38-42		

In Table 2 the data secured on 16 additional plants in 1967 are arranged. One of the plants (H-7) studied in 1966 was also restudied (Table 2). With the 17 plants analyzed in 1967 the chromosome numbers 40 and 42 were encountered most frequently. In one plant 36, and in another 38, were the most frequent numbers observed. In one plant 46 seemed to be the predominating number, while the euploid number 44 was most often encountered in 3 plants. Lower numbers were encountered in single cells in several cases.

DISCUSSION

It is clear from the data that in most cells, and plants, there has been a loss of from two to six chromosomes. Most often there has been a loss of either two or of four chromosomes. Very occasionally there is the gain of a pair of chromosomes. Also, it seems apparent that the range of chromosome numbers from cell to cell, within a given individual is greater here than is usually encountered in species.

The Notes column of Table 2 indicates that complete cells with 21, 22 and 23 chromosomes were observed. In one case what clearly appeared to be a complete cell, with wall intact, just as clearly showed only 7 chromosomes. Unprovable suppositions accounting for such numbers may be made. The 21, 22 and 23 chromosome numbers approximate the diploid number for the genus, and may represent a breakdown from the induced tetraploid, to the original diploid, number. In the second case perhaps a tetraploid ($2n = 44$) cell divided 37 and 7, with the $2n = 7$ cell not being immediately lost, but surviving for one or more cell generations.

There is considerable difference in vigor among the various static dwarf plants. So far we have not been able to correlate this with any specific chromosome number. It is possible that the loss of certain chromosomes—and genes—affects vigor and adaptability more than the loss of others. It also seems likely that where one, or a few, chromosomes are lost that these are not always the same ones.

Table 2. Chromosome numbers in some dwarf seedlings of **Hemerocallis washingtonia,** 1967.

Seedling number	2n		Cells counted	Notes (Nos.: 1st no. of cells; 2nd—2n)
	usual	range		
H201	38	36-43	8	3, **38**; 2, **36**; 1 each **37, 42, 43**
H202	40	40-46	30	10, **40**; 6, **42**; 6, **43**; 5, **44**; 1, **45**; 2, **46** (also 1 each: **21**; **22**; **23**)
H203	40	40-42	7	6, **40**; 1, **42**
H204	44	36-44	7	3, **44**; 1 each **36**; **38**; **42**; **43**
H205		40-44	2	1 each **40**; **44** (also 1, apparently complete, **7**)
H206	36	34-42	11	4, **36**; 3, **34**; 1 each **38**; **40**; **41**; **42**
H208	42	40-43	5	3, **42**; 1 each **40**; **43**
H209	44		1	1, **44**
H210	44	40-44	6	3, **44**; 2, **42**; 1, **40**
H211	42	40-44	4	2, **42**; 1 each **40**; **44**
H213	42	40-42	5	3, **42**; 2, **40**
H214	40, 42	38-44	8	3, **40**; 3, **42**; 1 each **38**; **44**
H215	40		1	1, **40**
H216	40, 42	40-42	2	1, **40**; 1, **42**; (+1, **22**)
H218	42	42-44	7	4, **42**; 3, **44**
H220	40	36-44	14	5, **40**; 4, **44**; 3, **42**; 2, **36**
H7	46	44-46	6	3, **46**; 2, **44**; 1, **45**

The loss, or gain, of chromosomes—and perhaps of particular chromosomes, would seem—plausibly—to be ultimately responsible for the abnormal growth habits of the plants studied. It seems clear that the analysis of other plants, as well as the more careful study of some of the plants already dealt with, offers the promise of throwing additional light on the factors involved. Such work is planned.

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4. AMARYLLID CULTURE

[REGIONAL ADAPTATION, SOILS, FERTILIZATION, IRRIGATION, USE IN LANDSCAPE, DISEASE AND INSECT CONTROL, ETC.]

1967 LYCORIS REPORT

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Developments are slow in the lycoris world. Since my last report, for 1964 (Plant Life 1965), I have continued to maintain a large collection of these bulb flowers and have kept at my hybridizing efforts. Bloom seasons have brought exciting moments and disappointments. Erratic performances by some of the species have left me befuddled at times But I find altogether fascinating the strange growth habits and sometimes sensationally beautiful flowers.

Insofar as flower production is concerned, "good" and "bad" lycoris seasons have alternated here for the past four years. 1964 and 1966 brought very fine floral displays. In 1965 there were fewer scapes but still enough to sustain interest. The past season—1967—has been most baffling. Bloom was light on most species and failed entirely on *L. caldwellii*, *L. chinensis* and *L. haywardii*. There was one scape instead of the usual dozens on *L. sprengeri*. On the other hand, *L.* x *jacksoniana* bloomed fairly well and the fertile *radiatas* came in great profusion.

Normally a poor lycoris season in this area follows a severe winter, but it was not so this time. Our last winter was relatively mild. We did, however, have a cool, rainy summer which kept grass and trees beautifully green and most flowers in fine condition. Apparently this was not to the liking of some of the lycoris bulbs which need an early summer drying-off period to trigger their bloom mechanism.

BLOOM CHART

A bloom chart showing dates and duration of bloom on various lycorises has been one of my projects for a long time. Ideally it would be based on data recorded over ten or more years on plantings which include a substantial number of bulbs of each species.

The accompanying chart falls short of my ideal—it simply shows bloom as it occurred during one good year, 1966, in my own Middle Tennessee area. It does not give a true picture of bloom duration on all kinds. Some of the rare sorts are represented by only two or three bulbs, while the *squamigeras* and *radiatas* grow by the hundreds in several different locations; naturally there is bloom for a longer time on the latter.

Each line on the chart following a named species extends from the date that species had its first fully developed scape, with all flowers in the umbel open, to the date when the last scape began to fade. Regrettably, I have not kept detailed records on blooming dates through many other years. But fragmentary notes show that blooming seasons of a given species may vary from year to year by two weeks or more from the dates shown for 1966. Correspondence with other growers indicates, as might be expected, that farther south, blooms come earlier.

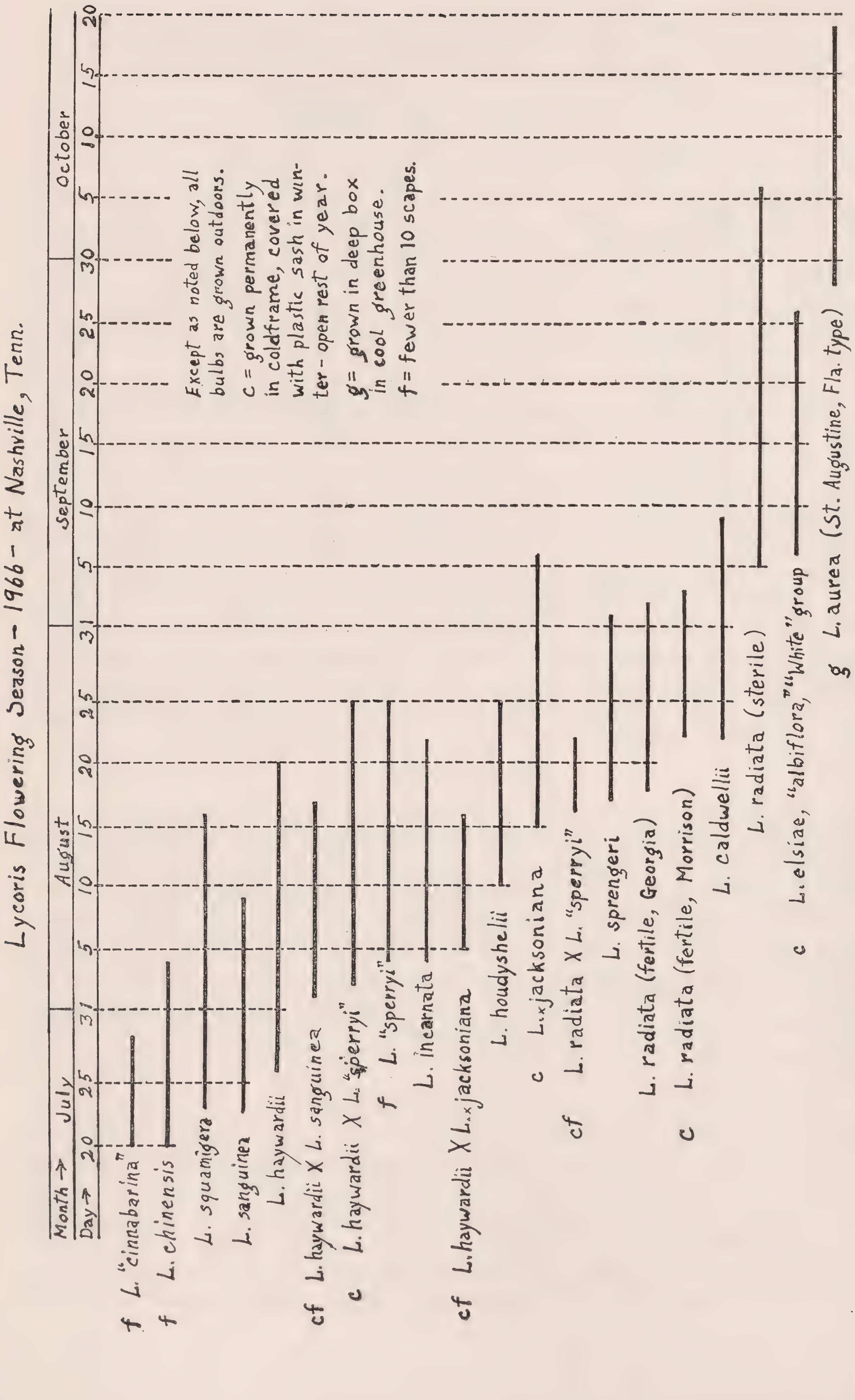

Fig. 20. **Lycoris** blooming chart showing dates and duration of flowering period for various **Lycoris** species and hybrids at Nashville, Tenn. in 1966. See text for further explanation.

With all of these qualifications, the chart will prove of interest, I hope—especially in showing that it is possible to have lycorises blooming continuously through two and a half months.

HYBRIDS

L. x *jacksoniana,* the *sprengeri-radiata* cross that first flowered in 1961, continues to be best of a number of hybrids that have now bloomed. Light pink through many rosy shades to deep purple-red in different individuals, these bulbs bring a new look to the lycoris genus. They flower well and bulb increase is good. Neither parent is a large lycoris, and so these hybrids are of modest size, but their color is wonderful.

As previously reported, one fault is the susceptibility of their fall produced foliage to cold weather injury. I have to grow them permanently in large coldframes which are covered with plastic sash in winter. Outdoor trial plantings in northern Mississippi and southward, however, appear to be performing satisfactorily.

From a cross of *L. radiata* by *L. haywardii* made in 1959, I have five bulbs. Two of them bloomed for the first time in 1967. The nearly identical scapes were at peak stage on July 20, 16 inches tall, with umbels 6½ to 7 inches across, one having six and the other seven flowers. Color was a soft medium rose, with violet streaks from segment tips inward. Actually, these could be mistaken for *L.* x *jacksoniana;* they bloomed, however, about two weeks before any of my *jacksoniana* bulbs.

In 1961 I used *jacksoniana* pollen on *L. haywardii* flowers. Of several resulting seedlings, one flowered in August, 1966 and another in '67. These were my first hybrids combining three different species—*L. sprengeri, L. radiata* and *L. haywardii.* While pretty, these were a bit disappointing in that, except for a litte stronger bluish-violet tinting, they, too, looked just like some of the *jacksonianas.*

More exciting was a 1967 scape of *L.* x *jacksoniana* crossed back on one of its own parents, *L. sprengeri.* Flower form was similar to *jacksoniana* but coloring was unique—very pale pastel tints of salmon and lavender. I will watch with special interest additional bulbs of this cross and of *jacksoniana* crossed with the other parent, *L. radiata.* There is much difference in foliage of these seedling bulbs, and flowers may be equally varied.

My 1964 report included descriptions and pictures of first bloom on the *L. haywardii—L.* ''Sperryi'' and *L. haywardii—L. sanguinea* crosses. Since then a number of additional seedlings of each cross have bloomed, but with no significant variations from the first flowers.

The 1964 report also carried a picture and notes on a cross of *L. radiata* and *L. chinensis* made by Dr. John Creech. In 1959 I used pollen of the big hardy yellow *L.* ''Sperryi,'' which is similar to *L. chinensis,* on *L. radiata,* and got about a dozen seedlings started. One of these bloomed in August, 1966 and another this year. Not surprisingly, they are much like the Creech hybrid—''spiderlily'' form and very soft yellow coloring. Aging flowers acquire pinkish tints. These are extremely pretty flowers. Thus far I have not been able to get seed on them or on the Creech hybrid, which has bloomed again. Most of the other hybrids seed freely, and I have small bulbs of many new crosses coming along.

NEW ACQUISITIONS

The late B. Y. Morrison, Pass Christian, Mississippi, used to buy ''white'' lycorises in quantity—100 bulbs at a time—from dealers listing them as ''Albiflora,'' ''Radiata alba,'' ''Albiflora carnea'' and the like. Many of these turned out to be the pastel tinted *L. elsiae,* but there were usually variants in each lot. He delighted in watching the bloom for distinctive and superior individuals, and he sent a number of these along to me. The last ones came in 1964, labeled ''L. albiflora Light Rose Pink.'' A letter explained that these had shown up in a shipment of ''Albiflora'' bulbs from the Walter Guille wholesale bulb dealers, Long Island, N. Y., and he thought they were an outstanding ''find.''

I was happy to concur in his judgment when a beautiful scape of silvery-pink flowers appeared in early September, 1966. Foliage and growth habits are like others in the big, confusing ''Albiflora'' group; it is the color that is unusual. Incidentally, in Plant Life 1964, Mr. William Lanier Hunt, Chapel Hill, N. C., reported finding in 1962 a new porcelain pink lycoris in a shipment of *L. elsiae* bulbs. My guess is that when we are able to compare these two, we shall find them identical. We have needed a pink lycoris of this type, and it is good to know that one does exist.

For several years Mr. James Giridlian has been offering a ''Lycoris cinnibarinum'' in his Oakhurst Gardens catalog. Thinking they must be the same as ''L. cinnabarina'' bulbs I already grew, I haven't ordered any. This year a young lycoris enthusiast, Philip Adams, of Marks, Mississippi, sent me one of several ''cinnibarinum'' bulbs he had from Oakhurst, and reported that he had flowered one on August 20 at his home in northwest Mississippi. Foliage, he said, is like that of *L. traubii.* The 17-inch scape carried seven flowers, making an umbel 8 inches across. In form the flowers are much like *L. incarnata* but color is a blend of light mandarin orange-red with strong suffusions of deep gold-yellow, strongest along center of segments. General effect from a distance is a warm apricot color.

I have flowered ''L. cinnabarina'' a few times, and it is clearly related to the early blooming, orange-red *L. sanguinea.* This new ''cinnibarinum'' has a different foliage habit and a different bloom season. As I viewed it in Mr. Adams' color slides, it appears to be quite distinctive—perhaps an entirely new species.

In July, 1965, Dr. Traub sent me two bulbs of the newly named *L. josephinae.* One bloomed in September of this year. It is a beautiful lycoris but in this locality it seems to be identical to the widely grown triploid form of *L. radiata,* which blooms at the same time. I cannot tell them apart either in flower or foliage.

UNSTABLE COLOR IN L. HOUDYSHELII

Since original publication of its name (Plant Life 1957) *L. houdyshelii* has been described as a "white" lycoris. Bulbs had been received from China in 1948 by Mr. Wyndham Hayward as "L. alba," indicating that the Chinese considered it white. My own early notes, based on observation of the first few scapes that appeared, state, "flowers open with a cream-white tint and then turn clear white; pistils are white, tipped pink, and the anthers carry yellow pollen." Color photographs made at the time confirm the description. Mr. Hayward wrote, "it is clear milky white, almost an oyster white, with sparkling brilliance in full sunlight."

There was no reason to suspect that those blooms in the early 1950's were other than typical. However, with additional observation of this species we learn that under some conditions the flowers are substantially suffused with pink. A bulb that I sent to Mr. B. Y. Morrison flowered with so much pink evident that he thought it was a mutation from the original type. Miss Edna Spalding, noted daylily breeder of Iowa, Louisiana, sent me a color slide showing bloom on a bulb I had supplied, and it was decidedly pink flushed. In 1964 I moved some of my bulbs from a garden location into a protected coldframe, facing south. Eleven fine scapes appeared in 1966, with flowers opening a rich cream and within a day beginning to show blush and pink suffusions which gradually deepened. Meanwhile, other bulbs remaining at the earlier location under a dogwood tree, had white blooms. And Mrs. U. B. Evans wrote from Ferriday, Louisiana that her *houdyshelii* was white.

The pink markings, as I have seen them, follow no set pattern but develop irregularly as faint to deep rosy tints over the creamy segments. Filaments and styles turn pink on the upper side only, remaining white underneath. I noted this color change in aging flowers of *L. houdyshelii* in the 1957 published description, but it appears now that the pinkish marks are sometimes present almost from the opening.

I feel sure that there has been no genetic change in the bulbs. Light, temperature, moisture, soil or other environmental factors apparently affect the color. Pink suffusions make the flowers no less beautiful; indeed, some think the pinkish blooms are prettier. But this information about the coloring should be publicized; otherwise people acquiring the supposedly white lycoris may be disappointed.

After observing *L. houdyshelii* flowering most years since 1951, it seems to me that the basic color is cream-white; certainly that is the way it opens. Under different conditions it may become quite snowy or definitely rosy. In any event it remains one of the most beautiful species known in cultivation. I only wish the bulbs multiplied faster.

Somehow, discovery of this changeable characteristic in one of my favorite lycorises reminds me of the slightly ribald description of a young coed I heard away back in college days: "She was pure as the snow but she drifted."

MISCELLANEOUS NOTES

In the 1964 Plant Life, I wrote of ''A New Yellow—Perhaps.'' This concerned bulbs from Japan distributed in this country in the fall of 1962 by at least one large wholesaler, under the label, ''New Import—Hardy Golden Spiderlily.'' The wooden bulb cases were stenciled, ''L. aurea'' and ''Grown in Japan.'' Enticed by an attached color picture and the ''Hardy'' claim, I bought an entire case—some 700 bulbs about 1⅝ inches in diameter. I planted over 500 of them for myself and in good faith sent out small trial lots to friends all over the country. Now it can be told that the whole deal was a hoax. About 5% of the bulbs proved to be *L. traubii,* which is yellow but far from hardy. The rest were just half-grown bulbs of common *L. squamigera.*

I still occasionally see ''Hardy Yellow Spiderlilies'' offered on plant counters of some of the variety stores. Bulbs appear to be *L. traubii*—a good lycoris but hardy only in Mid-South and milder areas.

Another batch of bulbs bought as ''L. purpurea'' has bloomed for me, and as always in the past, they turned out to be *L. sprengeri.*

Growing hundreds of seedling lycoris bulbs in ground beds (coldframes), I have a tedious weeding problem. New herbicides which inhibit the germination of seeds in the surface layer of soil are proving helpful. Treflan and Dymid (Elanco Products Co., Indianapolis, Ind.) are giving complete control of nuisance grasses and of many weeds, though there are certain winter weeds and an oxalis species still troublesome. Nurserymen and other commercial plantsmen currently use many chemical weed controls. Used with proper precautions, some of these are real labor savers for bulb growers.

AGAPANTHUS AFRICANUS VAR. HENRYAE

Mary G. Henry, *Gladwyne, Penna.*

Agapanthus africanus has been living out of doors at Gladwyne, Pennsylvania for over 25 years. Always it gives me its exquisite blue flowers just at a time when I need them most, for they are at their lovely best in mid to late July. This is usually a season when our spirits are somewhat bedraggled by the intensest heat of summer.

Mostly all our winters have some days of sub-zero temperatures and sometimes the ground freezes deeply. Once in a while, when I happen to think of it, I place a few evergreen boughs over them. Many winters they have had no protection whatsoever. Their situation with a photo was described in HERBERTIA 1961.

It was in 1960 that the idea came to me to try and raise some seedlings in order to see if I could get some improved ones. So on October 30, 1960, I gathered some plump seeds and planted them in a seed box, 12 inches by 24 inches and about 5 inches deep. The seeds germinated fairly promptly and the box was wintered in a sunny glassed in porch

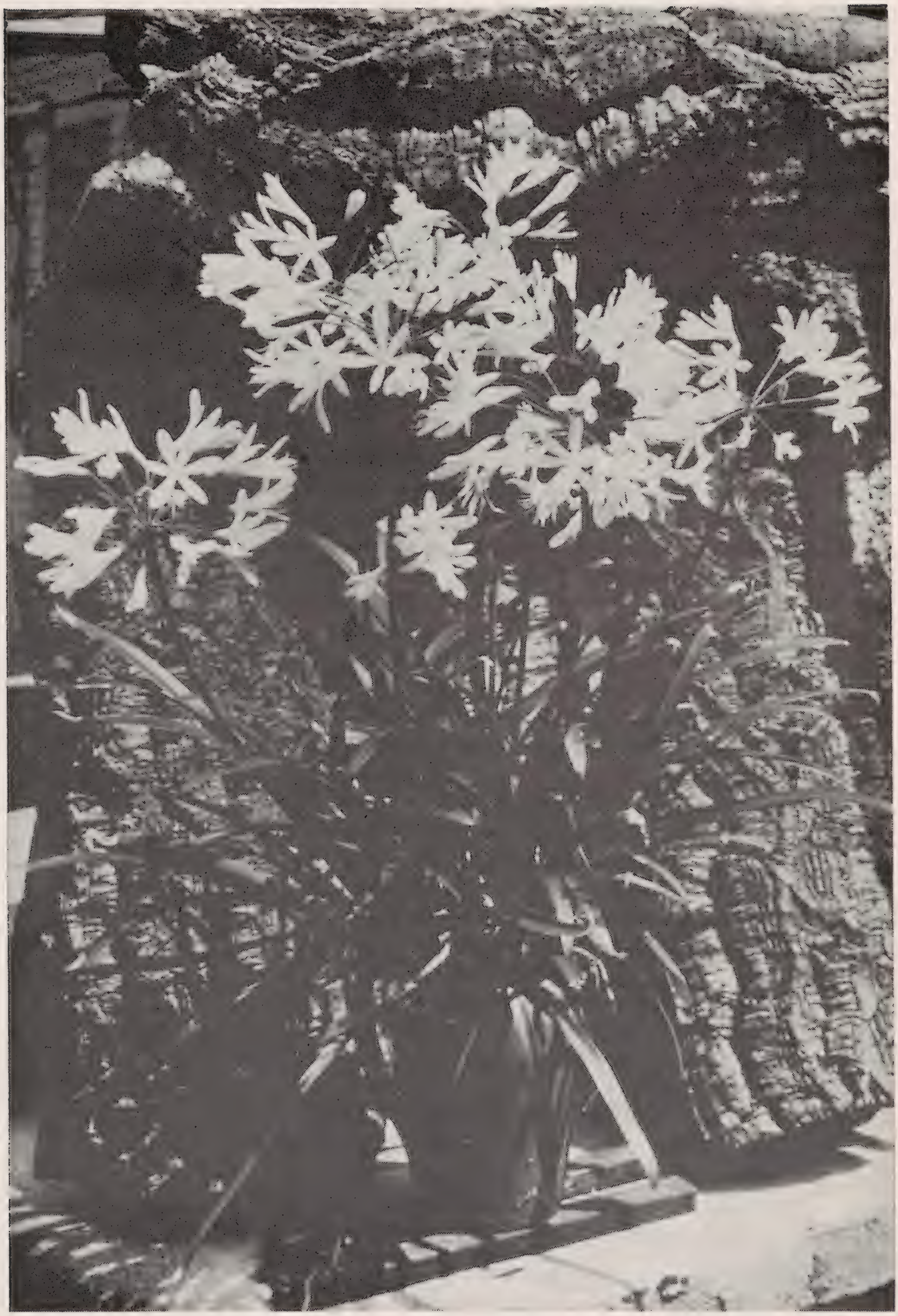

Fig. 21. **Agapanthus africanus** var. **henryae** Traub, as grown in a 6-inch pot at Gladwyne, Penna.

that had sufficient heat to keep the temperature above freezing. The following summer the box was placed outside in nearly full sun.

When the seedlings were two years of age, five of them flowered and one of them bore a beautiful head of pure white flowers. This one was removed from the seed box and I potted it separately in rich soil. It grew apace, and I was able to distribute it as follows:

On May 16, 1963, I sent several divisions to Dr. Hamilton P. Traub, La Jolla, California, who described and named it *Agapanthus africanus* var. *henryae.*

On April 1, 1964, I took and gave to Callaway Gardens, Pine Mountain, Georgia, a blooming sized plant.

On September 28, 1964, I sent several more divisions to the late Dr. Ira Nelson, Louisiana Society for Horticultural Research, Lafayette, La.

Last winter 1965-66, I was brave enough to plant out of doors in a permanent position, twenty-eight seedlings of *A. africanus,* including the white *A. africanus* var. *henryae.* This was done late in the year, October, which was not too favorable a time to plant them.

However, I had a carefully prepared bed made. It was dug about 1 foot deep and the soil was well mixed with ¾ inch crushed road stone and peat called ''Maryland Peat'', the latter from near Betterton, Maryland. The bed is surrounded by rather large, naturally placed boulders. They are shaded in summer for about a quarter of the day by old, deciduous trees. Dr. Walter Hodge, on a recent visit, said that they were native in just such a situation in Africa, which I had surmised.

Everyone survived the winter and came up well in the summer of 1966. Even the small plant of *A. africanus henryae,* freshly removed from the original pot, survived and made two flowering stalks, this past summer.

Not only as a pot plant, but also as an out of doors garden plant for a choice situation from Pennsylvania and Long Island southwards. *A. africanus henryae* has a bright and useful future ahead of it in our gardens. The accompanying photograph, depicting eleven spikes of flowers, shows its vigor in spite of the many pieces removed from it during its short life.

The remainder of the seedlings, twenty-eight blues, will be tested for form, size of flower and hardiness.

It has been an interesting adventure in breeding and I feel the reward for the time and trouble has been very great.

Aug. 30, 1966,
Gladwyne, Penna.

PLANT LIFE LIBRARY—continued from page 62.

THE NATURE OF BIOCHEMISTRY, by Ernest Baldwin. Cambridge Univ. Press, 32 E. 57th St., New York, N. Y. 10022. 1967. Pp. 111. Illus. Cloth, $3.50; paper, $1.65. This stimulating text is meant to be read rather than studied as an introductory course in biochemistry for high school and university students. The subject matter is concerned with the constancy of the internal environment, the function of the blood, proteins, enzymes, amino acid and nitrogen, carbohydrates, fat, the power-house of the cell, nucleic acids and nucleoproteins. Highly recommended.

A DICTIONARY OF THE FLOWERING PLANTS AND FERNS, by J. C. Willis, 7th Edition, revised by H. K. Airy Shaw. Cambridge Univ. Press, 32 E. 57th St., New York, N. Y. 10022. 1967. Pp. xxii; 1214; liii. $18.50. This 7th edition of Wills' Dictionary has been thoroughly revised. In order to achieve a moderate-sized volume, some matter that is dealt with more suitably in other works has been omitted. The main body of the book is devoted to a dictionary of the genera, families, orders and groups of higher rank of flowering plants and ferns arranged alphabetically. This is followed by a key to the families of flowering plants; a synopsis of the system Bentham & Hooker, 1862-93, and an index to the orders and groups of higher ranks. Highly recommended to all plant scientists.

TAXONOMY OF FLOWERING PLANTS, by C. L. Porter. W. H. Freeman & Co., 660 Market St., San Francisco, Calif. 94104. 2nd Edition. 1967. Pp. 472. Illus. 399. $7.75. This text on the basic principles of taxonomy is intended as a beginning course. The subject is reinforced with illustrated descriptions of more than a hundred families of flowering plants. Highly recommended.

SOURCEBOOK OF LABORATORY EXERCISES IN PLANT PATHOLOGY, by Arthur Kelman, et al. W. H. Freeman & Co., 660 Market St., San Francisco, Calif. 94104. 1967. Pp. 387. Illus. $8.50. Prepared by the American Phytopathological Society Sourcebook Committee, this book includes 227 exercises based on major subjects,-(a) principles of plant pathology; (2) physiological processes or functions affected; (c) biotic causes of diseases; and (d) types of crops affected. This book is indispensable for all teachers and students in plant pathology. Highly recommended.

PLANTS AS ORGANISMS, by Robert M. Page. W. H. Freeman & Co., 660 Market St., San Francisco, Calif. 94104. 1967. Pp. 87. Illus. 10. Paper bound manual, $2.75; individual studies, 20 cents each. The objective of the 18 exercises in this course is to present the beginning student with opportunities to acquire factual information about the structure, functioning and reproduction of green plants and fungi; and to encourage the student to develop useful skills and an attitude of inquiry. Highly recommended.

SYSTEMATIC EMBYOLOGY OF THE ANGIOSPERMS, by Gwenda L. Davis. John Wiley & Sons, 605 3rd Av., New York, N. Y. 10016. 1966. Pp. 528. $19.75. This book breaks new ground in bringing together those details of angiosperm reproduction which are not generally known. The introduction is concerned with (a) systematic and taxonomic characters, (b) taxonomic evaluation of embryological characters, (d) the anther, and (e) the ovule. The main body of the text is concerned with the embryological details of the plant families. The monumental bibliography of 215 pages on plant embryology alone is worth the price of the book. Highly recommended.

GENERAL VIROLOGY, 2nd Edition, by S. E. Luria and J. E. Darnell, Jr. John Wiley & Sons, 605 3rd Av., New York, N. Y. 10016. 1967. Pp. 512. Illus. $12.50. This second edition of a widely used text by outstanding authorities will be welcomed by all biologists. The introductory part outlines the basic measurements, physical, chemical and biological techniques necessary for the presentation of virology as a modern biological subject. The main body of the text is devoted to discussion of the accumulated knowledge on viruses, particularly bacteriophage physiology, and the biochemistry of animal virus multiplication. This new edition belongs in the library of all biologists. Very highly recommended.

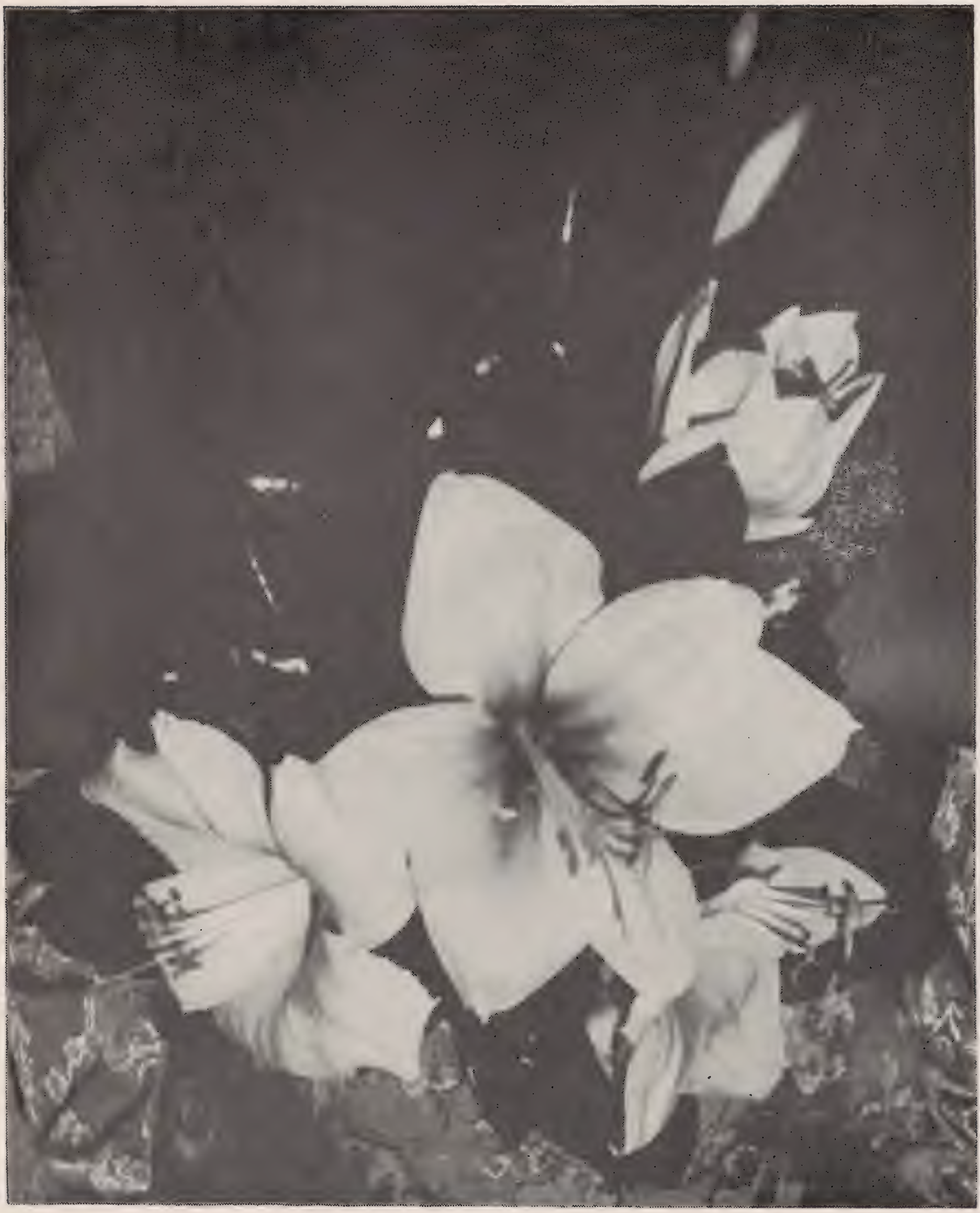

Fig. 22. Bouquet of bright Amaryllis blooms carried by the Maid of Honor at the Costa Mesa, Calif. spring wedding in 1967. Photo by Turville Studio, Santa Ana, Calif.

AMARYLLIS BLOOMS APPROPRIATELY USED AT A WEDDING

W. QUINN BUCK

At a beautiful early spring wedding in Costa Mesa, Calif., Chadwick Gardens, Redondo Beach florists, used their fine white amaryllis very effectively for the decorations of the church as well as for the bouquets of the bridesmaids. Our picture (Fig. 23) shows the bride under a large arch of the hugh amaryllis. The other picture shows the bouquet (Fig. 22) carried by the maid of honor.

Chadwick Gardens has found that by allowing the first bud on a spike to open in the greenhouse, the pot can then be stored for as long as three weeks in their cold room; the other buds will then open normally in the greenhouse, allowing for the use of large numbers of flowers at one time. Some of the exhibitors at amaryllis shows might be able to take advantage of this if they have access to a cold storage room.

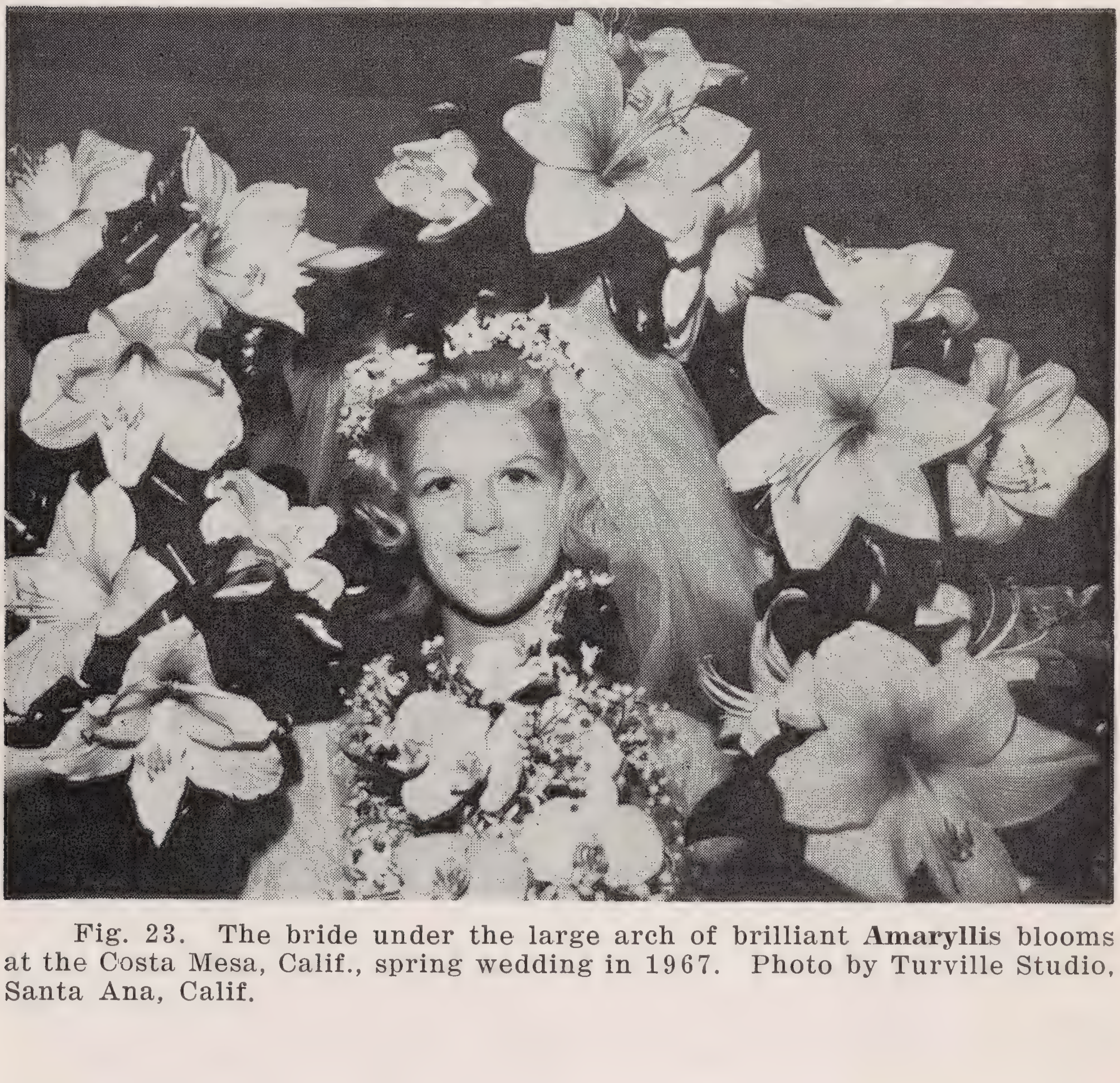

Fig. 23. The bride under the large arch of brilliant **Amaryllis** blooms at the Costa Mesa, Calif., spring wedding in 1967. Photo by Turville Studio, Santa Ana, Calif.

AMARYLLIS REGINAE AND CRINUM ERUBESCENS

J. L. DORAN,
1117 N. Beachwood Dr., Burbank, Calif. 91502

In 1964 we made a trip through Peru, where we collected a bulb or two from every group of amaryllis we found in the areas of Huanaco, Tinga Maria, Tournavista and down the Rio Huallaga (and some of its tributaries) toward Terapoto. Most of these bulbs were not in bloom when collected.

One of these bulbs bloomed in early 1966. The scape, just as the first flower was starting to open, was cut, along with one mature leaf, and packed in a long cardboard box. Crumpled tissue paper was placed around the scape and the flower to support them during transit. These were sent to Dr. H. P. Traub for identification, who wrote: ". . . is the finest type of *Amaryllis reginae L.* that I have seen, and it would be worthwhile to propagate it since many others would be pleased to have it in their collections". We selfed it and from about forty flowers obtained nearly a thousand seed, which were distributed in the United States.

In a swamp area about five miles east of Tinga Maria, growing near the banks of the Rio Huallaga, was found *Crinum erubescens.* The plant has channelled foliage (typical of the Americanum Alliance) and is stoliniferous, and usually has seven white reflexing flowers which open all at once. It loses its foliage at 32° but has grown vigorously and flowers regularly in Burbank, California.

NOTES ON WORSLEYA RAYNERI (BLUE AMARYLLIS)

BECKWITH D. SMITH
2036 Post Street, Jacksonville, Florida 32204

My association with *Worsleya rayneri* (Syn. *Amaryllis procera*), the "BLUE AMARYLLIS", actually began taking shape in 1940 when I read the article by Harry Blossfeld in Herbertia on his successfully collecting bulbs of this rare plant from the slopes of the Organ Mountains in Brazil, followed by another article by E. J. Anderson in connection with growing the plant in the West Palm Beach, Florida area. In the 1942 issue of Herbertia, there was another article on growing the "BLUE AMARYLLIS" in California. In the 1966 issue of Herbertia there was a follow-up article by Mr. Blossfeld which was most illuminative on the natural habitat and growing conditions, and further enhanced by most provocative illustrations of these magnificent plants growing, blooming and seeding on the mountainside. In the 1967 issue of Herbertia, Mr. Burr Clouette of Columbia, South Carolina showed a picture of his "BLUE AMARYLLIS" growing from seed.

At this juncture my nebulous dream of owning one or more of the bulbs became an obsession, and I began trying to locate a source from which I might procure some as soon as possible. I found a source of supply soon thereafter in Charles L. Harris of Griffin, Georgia, who informed me that he was importing a supply of the bulbs from Brazil. I made arrangements with Mr. Harris in February and March of 1967 to receive eight plants. After feverishly waiting for my bulbs all through April and May, I was finally rewarded by the bus depot calling me one Sunday morning in June saying that a carton of flower bulbs had arrived for me. I immediately went down and obtained my shipment. The bulbs were in excellent condition.

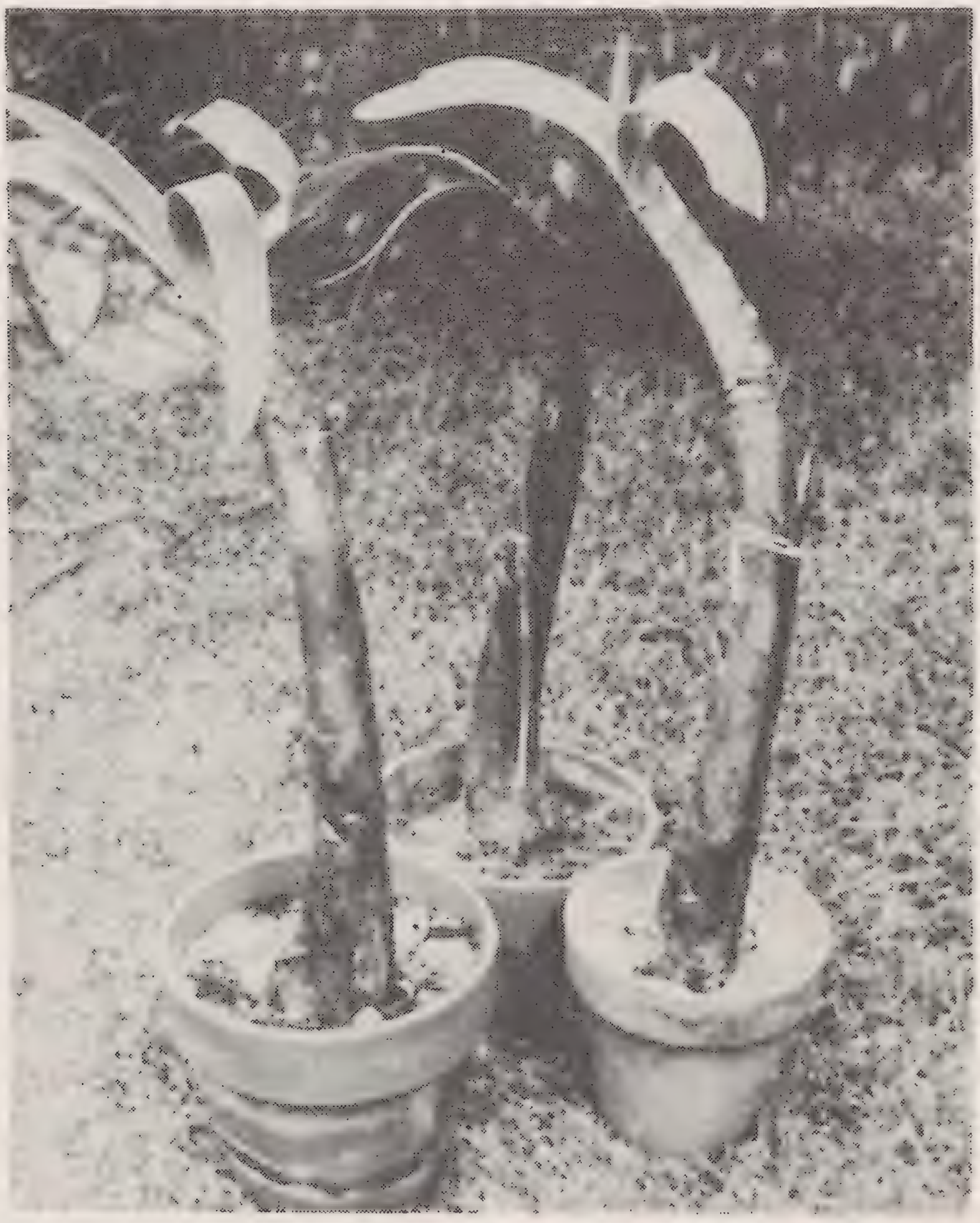

Fig. 24. The Blue Amaryllis, **Worsleya rayneri** bulbs in pots in the garden of Mr. Beckwith D. Smith, Jacksonville, Florida.

I made a mental note: "Happiness is having a BLUE AMARYLLIS!!" And up to the present, indeed it has turned out to be so. All during the period of waiting for the bulbs to arrive I had been reading everything I could lay hands on about the cultivation of this most rare Amaryllis, had prepared my soil, filling extra large pots and watering them copiously to be sure the mixture would drain properly. Upon opening the carton the big bulbs were found to have only a few stubs of roots on some, and on others no roots at all. The bulbs can best be described as "club shaped". There is no definition of neck from basal plate, the basal plate being from three to five inches thick, immediately joining the base of the bulb; and counting from the bottom of the basal plate to the upper end of the neck, where the leaves emerged, they averaged from 36 inches to 48 inches in length. Six bulbs had a curved neck, and two were almost straight. The leaves are glaucous, approximately 2 inches wide, and with a very narrow reddish strip on each edge. Lifting up the top leaf one finds another shorter leaf underneath, and lifting up this leaf there is another shorter leaf, so that finally the shortest leaf is only just coming out of the center of the neck. Their weight is approximately 5 pounds per bulb. A potting soil mixture was made of granulated peat, sphagnum moss, some clean sand and a little bit of rotted dairy manure. The bulbs were set in this with the basal plate just under the surface of the soil. Stakes were attached to each bulb to hold them upright.

This record is being written in August, 1967, so the BLUE AMARYLLIS have been planted for two months. Each day the pots are flooded with water, which slowly but surely drains away, and it is easy to see that the bulbs are making good leaf growth, all but two, and these seem reluctant to make a start, but perhaps they will in time. Also, these slow fellows are shorter in stature than the others. I only hope they are making a root growth. When winter comes, I may have to transfer them to a large flat container in the greenhouse, and apply bottom heat through the use of soil heating cable with thermostat. But if they make root and leaf growth prior to cold weather, it may be they will be content just to be moved inside the greenhouse. Figure 24 shows three of the BLUE AMARYLLIS, placed in pots and set in the center of the garden in order to get a good picture, but they regularly stay just at the edge of a Chinese Elm tree to get the morning sun, and thereafter be lightly shaded for the balance of the day. Here they receive ample humidity and good air circulation and I am humbly and prayerfully waiting for their blooming, and this will be a happiness which I will endeavor to share with all who want to see them at that time. Color pictures will also be taken. The bulbs I have are reported to be more than fifteen years old. Every attempt will be made to successfully grow them and a future report as to success or failure will be made.

ASEXUAL PROPAGATION OF **LYCORIS SQUAMIGERA** MAXIM.

Edward G. Corbett[1]

In an earlier report on asexual propagation of *Lycoris,* preliminary results of a greenhouse experiment with the techniques frequently used in the propagation of *Amaryllis* and *Narcissus* were reported for *L. radiata* and *L. sanguinea* (1). Since that experiment was conducted in a greenhouse, a second experiment was set up to test the most promising techniques under field conditions.

The earlier experiment had indicated that rotting of the bulbs after cutting might be a serious drawback, especially in the field where the dangers of infection would probably be much greater. It was felt, therefore, that the amount of rotting that might be expected should be determined under field conditions. The need to study the efficacy of these propagation techniques on other species of *Lycoris* was also considered in setting up this experiment.

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[1] Research Horticulturist, Crops Research Division, Agriculture Research Service, U. S. Department of Agriculture, Glenn Dale, Maryland.

MATERIALS AND METHODS

Bulbs of *Lycoris squamigera* Maxim., which produce its leaves in the spring, were dug on June 14, 1965 and allowed to dry over night. The bulbs were then graded by size and prorated to each treatment to assure a reasonably even distribution of sizes in each treatment. The treatments were: cross-cutting the basal plate into 4 equal segments about two-thirds of the depth of the plate, sectioning the bulbs into halves, and no treatment. The bulbs were dusted on the cut surfaces or basal plate with a 2:1 mixture of Hormodin #1 and Fermate. The dusted bulbs were allowed to dry for 2 days to promote suberization of the wounded surfaces and then planted about 4 inches deep in sand in a cold frame. The sand was construction grade. The bed received no supplemental irrigation during the experiment. Records were maintained at intervals on the appearance, growth, and senescence of the leaves. The bulbs were removed from the cold frame on June 8, 1966 and the results tabulated.

In order to further evaluate the treatments, 75 bulbs from each of the 2 wounding treatments were measured with a Vernier Caliper. A single measurement in the plane with the greatest diameter was made on each bulb and the results were tabulated. Length of the bulb was not determined, because this measurement appeared to be more closely related to depth of planting than to any other factor.

RESULTS

The number of young bulbs produced and the number of propagules which rotted are shown in Table I. As noted in the earlier experiment, there is a very marked increase in bulb production when the basal plate is cut. As had also been shown earlier, sectioning the bulbs gave a much greater degree of rotting such that the total yield of bulbs was reduced in comparison with simply cutting into the basal plate. However, rotting of the propagules was not a particularly serious problem in the field experiment.

The leaves began to push above the ground early in March at approximately the same time that the leaves were appearing on other nearby plantings of *L. squamigera*. There appeared to be no striking difference in the leaves other than their smaller size, although failure of some leaves to appear did serve as an indicator of the losses to rot. The leaves were starting to die at the tips on May 17 and were almost completely dried by June 1, somewhat ahead of the other *L. squamigera* plantings. The early senescence of the leaves can probably be attributed to the low fertility and relative aridity in the sand bed.

Table I. Results obtained from propagation treatments with bulbs of **L. squamigera.**

Treatment	No. of Bulbs	Propagules	Propagules Rotted	Propagations	Percent Increase of Bulbs
No treatment	22	22	0	23	4.6
Basal Plate Cut	21	21	0	110	523.8
Sectioned ½	21	42	12	83	395.5

Table II. Relative sizes of new bulbs produced by cutting the basal plate or sectioning the bulbs of **L. squamigera.**

	Diameter (mm)			Size Classes						
Treatment	Least	Greatest	Average	5-10	10-15	15-20	20-25	25-30	30-35	35-40
Basal Plate Cut	12.7	36.8	23.6	0	7	16	21	19	9	3
Sectioned ½	8.2	33.2	19.7	1	11	32	19	8	4	0

The relative sizes of the bulbs produced by wounding are shown in Table II. It can be readily seen that cutting the basal plate produced larger bulbs than sectioning. The average size of the bulbs produced by cutting the basal plate was almost 4 mm greater than that of the bulbs produced by the sectioned propagules. The smallest and greatest diameters noted on the bulbs from the basal plate cut treatment were larger than the corresponding measurements obtained on the bulbs resulting from sectioning. When the bulbs are placed in size classes, a very definite shift to larger sized bulbs with the basal cut treatment can be seen.

The results reported here show quite clearly that *L. squamigera* can be easily propagated by cutting the basal plate and setting the bulbs in a sand bed in the open. An increase of 5 to 1, with no evidence of rotting, as well as bulbs that are larger than the other treatment tested, offers a great potential for the rapid increase of this plant.

Further experiments on fertilization of the plants in the propagating bed, timing of treatments, response of other species to the treatments, and methods of reducing rotting will be made as time, space, and supply of bulbs permit.

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VERTICAL BULB CUTTAGE IN NERINE

Hamilton P. Traub

In the case of the two clones of *Nerine* x *traubianthe* Moldk., one a cross of *Nerine filifolia* x 'Rosabla', multiplies rather rapidly by producing bulb offsets so that it was possible to send some of these to others interested in hybrid nerines. However, the cross, *Nerine filifolia* x 'Inchmery Kate' gave a clone with a rather thick scape, and which produced no offsets. In order to distribute this clone, it was necessary to resort to vertical bulb cuttage (see summary, Traub, 1958). Bulbs are cut vertically into quarters and these are planted in coarse sand, kept watered until sprouts appear, when they are planted in a suitable soil mixture. As a preliminary experiment one bulb of each of the clones was cut vertically into quarters and the results are summarized in Table 1.

Table 1. Results from vertical bulb cuttage in hybrid **Nerine.** Bulbs cut November 1966; data taken August 15, 1967.

Clone	number of bulbs cut	number of vertical bulb cuttings	Number of new bulblets	Remarks
Nerine filifolia x 'Rosalba'	1	1	1	
		1	1	
		1	1	
		1	1	
Nerine filifolia x 'Inchmery Kate'	1	1	2	2 from same cutting
		1	2	ditto
		1	1	
		1	0	cutting decayed

The table shows that in all but one case at least one new bulblet was obtained. In two cases the cutting produced 2 bulblets.

It is hoped that others interested in Nerines will report on their results with bulb cuttage.

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THE 1966-67 AMARYLLIS SEASON

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Another amaryllis season has passed with more outstanding flowers in evidence than in many years. In the south the mild winters have been kind to the amaryllis the past few seasons. Also the last two summers have been favorable to amaryllis growth and still more important is the fact that our interest in amaryllis returns. So we probably have given them more care during the growing season. If we will see that our amaryllis have a constant supply of food by watering them each ten days to two weeks with a weak solution of plant food we will be more than rewarded with a fine crop of blossoms in the spring. We must always remember that if our amaryllis are in pots that are set outside each rain may leach out the plant food. It is important to replenish this food after each rain. I find pressing business, pure laziness and other attractive nuisances often cause me to neglect fertilizing and spraying my amaryllis as often as I should. This year I have done a little better and I am sure next spring I will be rewarded with much nicer blooms. The little additional care you give your amaryllis surely pays off in flowers.

In the past several years I have made a number of tables to set a large number of my potted plants on. This gives them better air circulation and is a lot less wear on the back taking care of them: I would like to suggest that you will find you will have more success with your amaryllis if you put some of the money you might otherwise use to buy bulbs into equipment to make it easier to take care of them. If it is easier to take care of them you will not be as apt to neglect them and the following season I feel sure you will have more beautiful flowers than you would have had if you had put all your money into buying bulbs. Having a lot of bulbs does not in itself assure you of flowers. While you can brag to your neighbors all summer about how many varieties you have if you do not take care of them you may be embarassed when you have only a few small flowers to show him in the spring. One well grown bulb is worth a dozen that do not flower. Of course there are those who do not try to carry bulbs over from year to year but just buy a few prime bulbs to flower each season. They figure they get their money's worth when the bulbs flower. They throw the bulb over the back fence after they have flowered. They do not bother with the fuss of taking care of them during the summer. But for those who like the challenge of growing amaryllis much satisfaction can be found in taking care of their plants all summer. I can not quarrel with either method. But I am the type who can go out in my amaryllis patch and admire the bulbs during the summer. Good foliage and a plump bulb even looks pretty to me when they are growing well.

SIZE OF BULB TO BUY

I am often asked which size bulb is best to buy. This is a hard question to answer but I will try as best I can. Generally speaking there are about three sizes commercially available. These are basicly 24/26 cm., 28/30 cm., and 32/up cm. size. I really think that one gets about the same value regardless of the size he buys. It is more the end use to which you will put the bulb. If I were buying to make a bed of them in the south I would purchase the 24/26 cm. size or smaller. I would have in mind getting the most amaryllis for my money and that I would give them the care they needed to make proper growth. The 24/26 cm. size usually will make one or two flower scapes and those with a modest income can get a wealth of enjoyment from two or three of these bulbs planted each year.

If the price of the bulbs is not a great factor to you then you might decide to purchase the 28/30 cm. size. This size, if the bulbs root well will give much larger flowers generally than the smaller size bulbs. The larger bulb, if it is well cared for, should recover for the next flowering season easier than a smaller bulb. You will find certain varieties in the 24/26 cm. size literally will flower themselves to death while others make a more modest spike it can support.

If one has the money to put into bulbs one might choose the larger size bulb. The largest bulbs usually make the largest flowers. If the bulb does not root well it still will make a better spike than the smaller bulb. Also the larger bulbs often make three spikes. If you want exhibition flowers get the largest bulb available. In this regard if you have ever seen an 'Apple Blossom' from a well rooted 32/up cm. bulb it is a gorgeous thing—much prettier than from a small bulb.

Generally speaking a person will be more satisfied if he puts his money in the largest bulbs he can buy. He will not have as many bulbs, but his chances of success are better and I feel he will be much more pleased with the results the first season. If you are a beginner I suggest the 28/30 cm. or the 32/up cm. size bulbs. But if you have mastered their culture you can surely have more varieties at less cost with the smaller size bulbs.

WHAT VARIETIES TO BUY

If you are a new fan do not just buy the variety you happened to see take the largest or best flower in the show. Normally I feel the new fancier is better off asking a reliable amaryllis dealer to send him several varieties he thinks would be easiest to flower. You might suggest the color but more than likely it would be best to leave the color to him. When the dealer receives your order he can pick good varieties that have made the best bulbs that year. The bulb dealer is interested in you having success and he never knows until he receives his bulbs which varieties will be in best condition. He will more than likely pick varieties which had held their roots when he received them. If you receive bulbs with roots your chances of success are much better provided you do not use too heavy a soil or over water them and rot the roots. If you prefer picking your amaryllis I might suggest a few that generally give good results each year.

White: 'White Christmas', 'White Giant'.
Pink and White: 'Floriade', 'Little Diamond', 'Rose Marie'.
Pink: 'Dutch Belle', 'Daintiness', 'Fritz Kriesler'.
Medium Rose: 'Rubia', 'Bella Vista', 'Queen of Pinks', 'Queen of Sheba'.
Dark Rose: 'Moreno', 'Bordeaux'.
Blend: 'Day Dream', 'Cupido'.
Salmon: 'Mozart', 'Beautiful Lady', 'Rilona'.
Orange Red: 'Orangedale', 'Tangerine', 'King Gustav Adolf IV'.
Medium Red: 'Scarlet Leader', 'Flamboyant', 'Rembrandt'.
Dark Red: 'Tarakan', 'Vintage', 'Purple Queen', 'Red Master'.
Red & White: 'Hellas', 'Thalia'.

Of course if you do not see a favorite of yours on this list, I possibly just forgot it. I could not list all but only a few that come to mind at this time. Of course there are many fine new clones that will prove most worthwhile.

TRENDS IN AMARYLLIS HYBRIDIZING

Several noteworthy trends in hybridizing are showing up in the newer varieties on the market. One factor results from the demand for amaryllis as cut flowers in Europe. The growers have given emphasis to getting two scapes of flowers at a time, better lasting quality of flower, less fragile flowers and up to six flowers per spike. The lasting quality of flower has possibly reached its highest degree in Van Meeuwen's 'Hellas'. It makes six flowers per spike and will last for weeks if the weather is cool. Van Meeuwen is placing more emphasis on six flowers per spike than any other grower and many of his new varieties make six flowers. He does not like the 6 flowers to open at once but two at a time so the first 2 may be picked off when the last two open thus giving a long season of flowers per spike. Most of these clones that give 6 flowers per spike last longer in flower than the older ones. The Van Meeuwen firm has made great strides in their hybridizing recently and they were awarded three gold medals in shows last season. This was more than any other Dutch Amaryllis Grower received.

The Van Meeuwen firm is striving to introduce more free flowering kinds also. You will find their newer bulbs are generally more free flowering, have more flowers per spike and last longer. For many years Van Meeuwen leaned heavily to the red varieties and still seems to favor this color but has in the last several years introduced some outstanding varieties in other colors, blends and bi-colors. They have several extremely late flower clones that were introduced last year. These reds are 'Donnar' and 'Etna'. They are fully two weeks later than most other clones and appear to have near kin-ship with *A. Aulica platypetala.*

Warmenhoven in the past several years has introduced some fine clones that have been a departure from the solid colors which were so popular when Dutch Amaryllis first became well known in this country. These are 'Floriade', 'Golden Triumphator', 'Florileen', 'Little Diamond' and 'Mt. Everest'. Warmenhoven's clones generally are very large flowering but do not all make four flowers per spike. His new clones generally are very vigorous and probably more adaptable to outdoor culture in the south than other Dutch clones. I am quite sure he has kept closer to the old Leopardii line which instills vigor.

I am told that Warmenhoven is interested in the cut flower trade and is developing clones that are more useful in this respect. One orange clone I received last year in some quantity made two spikes at once with four open on each spike. This group of clones were probably sent to me by accident for another clone but although the flowers were not as large as most of Warmenhoven's clones they were excellent pot flowers for the florist trade.

Ludwig and Co. are best known for their pink varieties. They are still the only firm that offers such clones generally to the public. They have made great strides in improving these and have a number of light pink and medium rose pink clones on the market. 'Dutch Belle' is possibly the best formed pink they have and flowers rather freely. 'Flora Queen' generally flowers rather poorly for me the first year; however I find it the easiest to maintain and generally after the first year I can get wonderful flowers from it. It often makes six flowers per spike. 'Trixie' is a fine medium dark rose from Ludwig and Co.

Generally the Dutch hybridizers have increased the color range considerably in the past several years and particularly in the bi-tones and blends. They have constantly increased the number of flowers per spike, increased the free flowering habits and are striving to perfect amaryllis that will become popular for the florist trade.

NAMED CLONES

The most popular and most widely grown clone today and possibly the first amaryllis to be established as a commercial variety is 'Apple Blossom'. Most growers cultivate it as it is in great demand and fills the requirement as a commercial clone. It does not decline in vigor as many others do. Possibly the next most cultivated clone is 'Ludwig's Dazzler'. This clone can make extra large bulbs which makes it a most desirable commercial clone. 'White Giant' is also a fine commercial clone. The shrimp and white colored clones, 'Margaret Rose', 'Sweet Seventeen' and 'Day Dream', which are very similar, are very popular and are fine commercial types. The White flushed pink clones have become very popular also in the past few years and are generally easy to flower. The most sought after type however are the picotees which are always scarce.

I have lost my interest for trying every new clone that is introduced each year. I seem to become more interested in them after I have seen them for several seasons; so if I do not mention your favorite new clone do not be disappointed.

WHITE CLONES

'White Christmas', 'White Giant', 'Flying Cloud' and 'Oasis' are fine free flowering clones and each season restore my faith in them. There are a number of other good whites which I will not mention. We all have our favorites. One I would like to mention is C. Warmenhoven's white. These generally are not named. They have an ivory white color when first open as with 'Oasis'. I feel they are a little different and worthy of note especially as I consider they have more Leopoldii genes in them and this should make them more suitable for outside planting in the south. Do not feel I am selling other old clones like 'Maria Goretti' short. It and other clones such as 'White Giant' do well planted out in the south.

NEAR WHITE

The whites penciled or flecked slightly with red are striking. Two clones, 'Marion' and 'Peppermint', are most noteworthy in this particular color. I am sure there will be others. The picotee type, white edged red is still extremely popular, flowers easily the first season, but some have trouble maintaining it after the first year. It does bloom from small sizes so try a smaller pot and do not try to make too large a bulb. There will be newer clones in Picotee types that will be improved. Picotee is surely one of my favorites and a most beautiful type.

BI-TONES AND STRIPED CLONES

Ludwig's 'United Nations' and 'Carousel' are still very popular and make nice large flowers. For sheer beauty 'Florilien' is exceptional. It is an immaculate white veined heavily with bright red. It is outstanding. 'Hellas' is a fine new red and white bi-tone which makes six flowers per spike and keeps for weeks. 'Orion' is a fine new white striped red that grows vigorously and should prove to be a fine show flower as it gets large.

PINK & WHITE

A very popular group with many good clones to choose from. Possibly the largest is 'Floriade'. 'Apple Blossom', however, will make a huge flower from large bulbs as the size of the flower in this clone varies remarkably with the bulb size. If you can obtain the true 'Little Diamond' it is one of the most beautiful amaryllis I know. It will make two spikes at once with four flowers each of perfectly round flat form. 'Pygmalion', 'Rose Marie', 'Rosy Dawn' and 'Love's Desire' are all fine white and pink clones. Possibly I should mention 'Thalia' here. This new one from Van Meeuwen, more rose or red and white than pink and white, is a most beautiful and free flowering clone especially when given a little shade.

BLENDED COLORS

'Day Dream', 'Margaret Rose' and 'Sweet Seventeen' in shrimp pink and white are the most popular still. 'Catherine Valenti' is a very large frost rose and white that is exceptional. 'Golden Triumphator' and 'Cupido' are extra fine golden orange and white clones.

PINK CLONES

Ludwig and Company is the only firm that offers any number of these clones. 'Dutch Belle', 'Heaven Sent' and 'Flora Queen' are all beautiful.

ROSE CLONES

In soft rose the new African clone, 'Coral Seas' is exceptionally beautiful. 'La Forest Morton' in medium rose is still a leader. 'Trixie' is fine in the darker shades along with 'Rubra' and 'Rosedale'. 'Elvira Armayo' and 'Muscotel' are similar color having a lavender tone. Both these have their admirers. In dark rose 'Moreno' and 'Bordeaux' along with 'Mystery' fill the bill.

BRIGHT RED AND LIGHT RED

Often when one talks about bright red or light red the two get confused. I assume bright red has more fluorescence and light red leans toward pink but often the lighter reds are the brighter. This is a color tone that is being neglected but I feel some progress is being made. Like 'Barbarossa' which was a nice bright red these clones tend to degenerate to orange red. 'Red Rover' is a nice light vermilion variety. 'Donnar' is a light bright scarlet of note. The new clone, 'Etna', is still lighter and brighter. These two should be a welcome addition. Both are extremely late varieties and have slightly different texture and color from the other reds.

SCARLET

'Scarlet Leader' is possibly the best all round scarlet I know. 'Scarlet Triumph', 'Red Champion' and 'Clone 65' are all good scarlets.

MEDIUM RED

I think the 'Flamboyant' and 'President Kennedy' are possibly the leaders in this particular color. Both are fine reds of different form. I personally like the open face of 'President Kennedy'. The petals do not tend to roll back in this one as with other clones. 'Rembrandt' is a fine medium red that should not be overlooked.

DARK RED

The list of good dark reds is growing very fast. Van Meeuwen has introduced several good ones in this color recently. 'Belinda', 'Bernice', 'Mars', 'Pandion' and 'Tarakan' are a few. All are too new to be properly evaluated but so far 'Tarakan' has impressed me most. It is free flowering and is an exceptionally fine clone. In the African amaryllis several new dark reds are available. They are also too new to comment on but should not be forgotten. 'Purple Queen' and 'Red Master' are fine wine reds. My 'Purple Queen' plants last season made huge blooms, possibly the largest flowers I had. 'Ludwig's It' is a fine dark red. 'Vintage', another African amaryllis, has won many friends these past several years. And we must not forget Ludwig's 'Franklin Roosevelt'.

SALMON & ORANGE CLONES

In this color it is hard to find clones that do not degenerate to orange red. Ludwig's 'Beautiful Lady' is one of the leading salmons. 'Mozart' is a fine new salmon. 'Rilona' is the lightest salmon available and 'Hecuba' is a fine deep salmon. Many still favor 'Queen Page'. In true orange there are few. 'Orange Orchid' has flowered more red the past few years. It was wonderful for several seasons but tends to bloom red. 'Orange Wonder' still remains orange and possibly this is why it is called orange wonder. Few stay in this color. 'Delilah' is a fine tangerine orange and 'Orangedale' is a similar color.

ORANGE RED

I feel the leading one in this color is possibly the African clone, 'El Toro'. However it gets redder each year. 'Cavalier' and 'Cherokee' are fine orange reds. The new clone, 'Nitora', might be classed as an orange red. It, however, is possibly more a medium red with a fiery orange overtone. This makes it especially beautiful.

AFRICAN AMARYLLIS

I would like to mention particularly the Hadeco Strain of African amaryllis as these are generally grown from offsets rather than cutting and apparently do well here in the south. There are a number of fine clones introduced by this firm particularly in the white and rose bitones, dark reds, orange reds, and rose colors. These clones are shipped from South Africa in late August or early September and are available in early October. The first year they flower in the fall in about 5 to 6 weeks after they are planted. Many people have the mistaken idea that these amaryllis will flower in the fall each year but this is wrong. They are no different from the Dutch hybrids in this respect and will revert to spring flowering in the northern hemisphere.

AMARYLLIS SPECIES

My interest in these rises and falls very sharply from time to time. I have spent several thousand dollars having them gathered in South America. Then I took orders and had great expectations only to be disappointed myself and to have to disappoint my customers. I have discontinued trying to sell them.

I would like to comment on several of the species, however, particularly from the standpoint of developing new hybrids.

Amaryllis leopoldii This species has been lost to cultivation which in itself is a mystery. I believe the Warmenhoven strain is more nearly developed around this species or genes than any other hybrids. I have one hybrid clone from Guatemala that when selfed produces seedlings with pure white, white striped, picotee types and 'Beacon' type flowers along with many other seedlings that nearly resemble *Amaryllis leopoldii.* Time has not permitted me to investigate selfing these offsprings but I feel this hybrid has a great deal of *A. leopoldii* in it. The offspring generally do well in this location and this gene line, I feel, is possibly best for outside planting in the south.

Amaryllis aulica. Generally the form of *A. aulica* I have does well here, but they have to be given winter protection when temperatures fall below 30° F. They grow well in peat with a little lime and cow manure added. They require some shade for best results. It is generally the most robust and vigorous species I have.

Amaryllis aulica stenopetala This is exceptionally robust and vigorous. It, however, needs to be kept dry during June and July to get a good number of flowers. It can be expected to bloom from September to November.

Amaryllis aulica platypetala This species grows well here and is possibly more adapted to this region than *A. aulica stenopetala* as it flowers in July and August and tends to go dormant in the winter. It makes sufficient growth in summer to maintain itself in a flowering condition. I consider this one of the very best species for hybridizing to improve amaryllis hybrids for the south.

Amaryllis psittacina This species seems to just about hold its own here neither dying out or flowering very often. Possibly with a little special care it could be pot-cultivated here. As I have found *A. aulica* requires more shade than I suspected this is possibly the case with *A. psittacina* also.

Amaryllis elegans This species fails to respond here as I feel the climate is too wet and hot for it. A more airy, cooler climate possibly would be better.

Amaryllis striata This species will grow like a weed during the summer here only to rot during the winter. It appears to like a sandy soil but I do not think it likes it cooler than about 60° F. The bulbs are very fleshy making rapid growth and appear to be hard to store.

Amaryllis reginae I have only had fair success with this species here. It will grow like a weed for a while only to rot later. It, too, like *A. striata* appears not to be able to take cool temperatures. I fear I have also given it too much sun and it apparently requires more shade.

Amaryllis belladonna This species will naturalize in the Jacksonville area where it is well drained and where roots of trees and shrubbery take up enough water during the winter to protect it from getting too wet and cool.

Other species only do fairly here without special attention which I seldom have the time to give. Possibly in a year or so when I retire I may find that time. I do hope so for I feel there are possibilities in hybridizing for many colors and types of amaryllis not available on the market today. With more understanding of the requirements of these new hybrids I feel we can find much better pot plants for our northern fanciers that can be maintained year round year after year.

I would like to pass on to you a few tips which I hope will improve your flowers next season. First I feel the greatest cause for failure is insect damage to roots and under fertilization of plants. *One can help his amaryllis greatly if he will drench his potted amaryllis with a solution of Cygon and water each 6 to 8 weeks.* Be sure you have an open textured soil and that the plant has a plentiful supply of fertilizer at all times. Watering your plants regularly with a weak solution of liquid fertilizer will help. Remember if your potted amaryllis is set out doors during the summer months each heavy rain will wash most of the fertilizer out of the pot; so fertilize after each heavy rain.

AMARYLLIS STRIATA FOR RAPID INCREASE

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While my primary plant interest during the past 20 years has been in the amaryllid genus *Narcissus,* I have also grown a few bulbs of the genus *Amaryllis.* I have been limited in that activity by my inadequate growing facilities for that rather tender bulb. (I should not have left my native home in southern California.)

About six summers ago a member of a local garden club gave me three small plants of a thing she said was an amaryllis. The largest of the three bulbs was not over an inch in diameter. I planted each in a pot and kept them outside until danger of frost when I took them in and kept them in a window until spring when they went out again for the summer. By autumn the plants had grown until they nearly filled the six inch pots with vigorously-growing offsets.

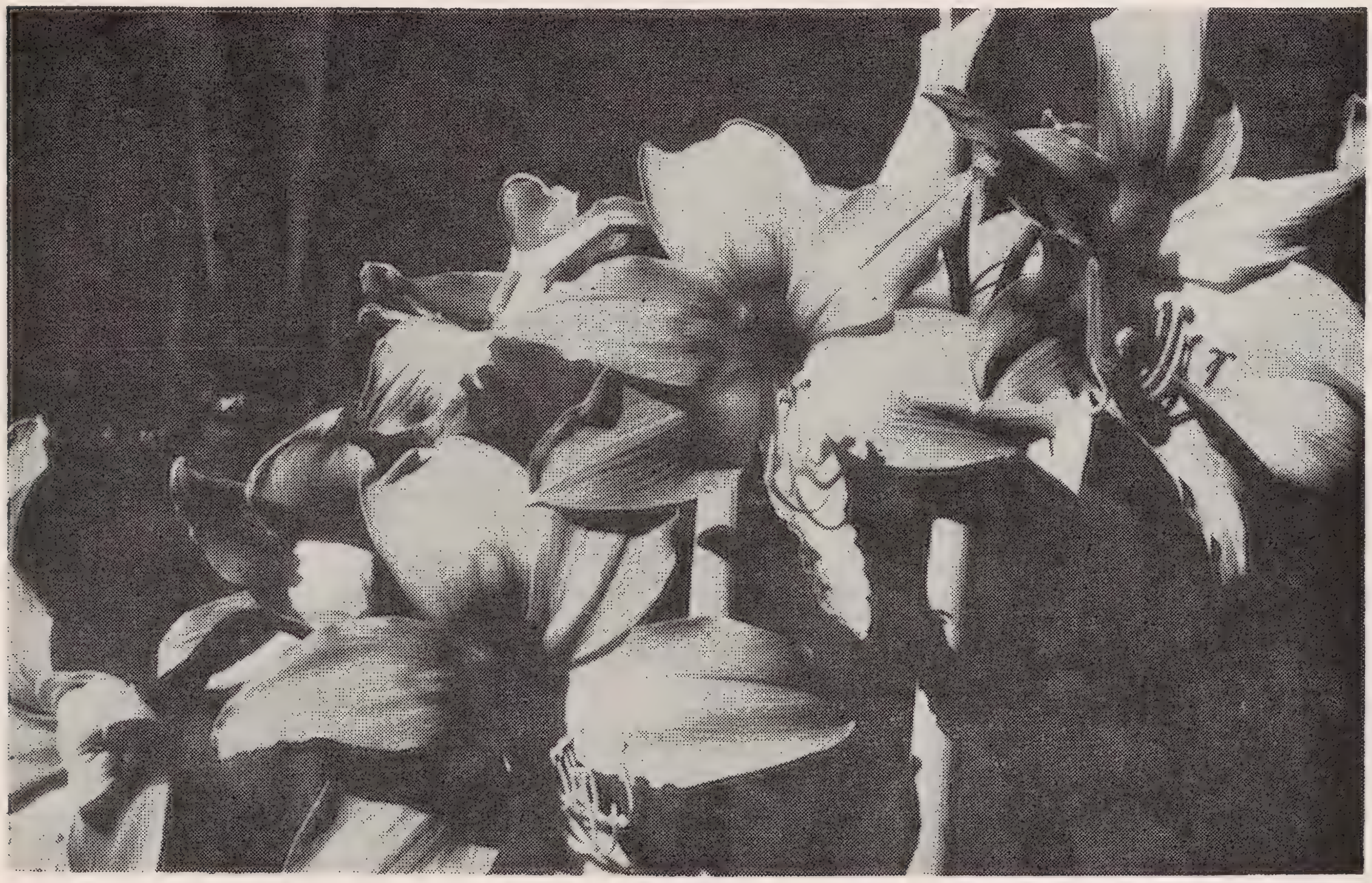

Fig. 25. **Amaryllis striata** Lamarck as grown by Willis H. Wheeler. Arlington, Virginia. Photo by W. H. Wheeler.

Growth continued inside during the autumn and winter. In February scapes pushed up quite tall. Each carried four florets. As one of my Japanese plant pathologist friends observed, they were not spectacular, being orange-red with a narrow white stripe along the middle of each narrow perianth segment. Since I have been an amateur plant breeder for many years I selfed the blooms and copious seed production resulted. Crossing with Dutch and South African hybrids also resulted in plentiful seed.

I have been interested in the vegetative increase of bulbs of the genus *Amaryllis* since the time some years ago when I discussed the matter with two raisers of that flower. They were hopeful that it might finally be possible to have good clones of amaryllis that would reproduce rapidly by bulb division. With that in mind I wondered if my amaryllis acquisition, tentatively identified by Dr. Traub as *A. striata*, might pass on to its offspring the ability to reproduce by the more rapid production of offsets.

WHEELER—**AMARYLLIS STRIATA,** continued on page 125.

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PLANT EXPLORATION IN MEXICO, 1966, 1967

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In 1966 and again in 1967 the writer has continued making plant exploration expeditions into Mexico, for the purpose of introducing new bulbous material to science and the horticultural world. Mexico is especially rich in bulbous plants owing to its diverse geography and seasonal rainfall, which makes for a variety of climactic conditions. Bulbous plants of some kind are to be found nearly everywhere, whether in the deserts, the mountains, or the lower tropical regions. The *Amaryllidaceae* are represented by *Allium, Habranthus, Sprekelia, Crinum, Hymenocallis, Amaryllis L., Bessera, Milla, Dandya, Petronymphe,* and *Zephyranthes.* No doubt there are others as well, but we also find Irids growing from true tunicated bulbs of the *Tigridia* group and its allies, such as *Nemastylis, Rigidella, Cipura,* and *Eleutherine,* not to mention the many tuberous rooted *Sisyrinchiums* and the fibrous rooted *Orthosanthus. Oxalis* growing from truly scaly bulbs, as in the genus *Lilium,* are found in some form almost everywhere. The *Liliaceae* are represented in the many species of *Calochortus, Zygadenus, Anthericum,* and *Schoenocaulen,* to name but a few. The bulbous members of the *Agavaeae* are best seen in the many *Manfredas, Bravoa, Polianthes,* and *Runyonia.* Other families, such as Begonias, Gesneriads, Aroids, Gingers, Bromeliads, Marantaceae, Musaceae, Commelinaceae, and Orchidaceae, have their terrestrial bulbous representatives. Even some cacti are tuberous rooted as are the Dahlias.

I. 1966 EXPLORATION—JULY 10 THROUGH 26, 1966

In 1966 the writer was accompanied by James N. Giridlian of Oakhurst Gardens fame, and the trip covered much of Central and Southern Mexico, as well as Guatemala. Over 160 collections were made, but if one includes bromeliads and orchids, it is certain that the number of species was well in excess of two hundred.

Our trip enveloped 5000 miles and included the many adventures that such a trip normally accrues. James had traveled in Mexico before, so he was pretty well prepared for what was to follow, though he does not speak Spanish. His wide knowledge and keen interest in plant life of all kinds made the trip especially interesting for both of us and we found it mutually educational as well. Although the trip went quite smoothly, it was not without its pleasant and unpleasant aspects. There were the usual border delays, and while Mr. Giridlian remained hale and hearty, the writer, (who had never been seriously ill on the many trips over the past fifteen years) finally contacted the dreaded amebic dysentery just as we were returning home. This little souvenir literally ''bugged'' me for several months after returning home, but it has not discouraged me from continuing my field trips.

Although we had been very careful about locking our car, we slipped up the one time that we forgot to do so, and had two of our bags lifted from our car in broad daylight in Mexico City while stopping for lunch on our way homeward. Unfortunately one of the bags contained James' camera equipment, as well as our tourist cards and car permit. As if the loss of some of our valuables was not enough, the loss of these necessary papers caused a delay of one day at Nuevo Laredo before they would allow us to re-enter our country, and we were fined sixteen dollars each as well for not having our papers with us. Our explanation that we had been robbed failed to create any sympathy. It is times like these when you can appreciate the good old USA, no matter how much it is criticized, either justly or unjustly.

James took it all in stride and never complained, although I must confess that I showed my impatience with the Mexican authorities while being detained so unnecessarily. I believe that they were finally as glad to be rid of me as I was to be rid of them!

While I won't go into the details of every collection made, I will try to point out some of the highlights. The first day of our trip found us driving from the City of San Luis Potosi, San Luis Potosi, to the city of Queretaro, in the state of Queretaro. Many stops were made, but since most of this area is on the dryer side in the central plateau country, few really new species were to be found. It mattered little to James though, as it was his first trip to go a-bulbing in Mexico (his previous trips had been in search of epiphytes in the southern tip of Mexico) and he was eager to collect any new plants that he found appealing. This included *Zephyranthes longifolia, Habranthus concolor,* and an unidentified white *Habranthus* species. The latter was collected along with many other interesting plants on a short side trip into the mountains East of the City of San Luis Potosi. Here too grew *Milla biflora, Zephyranthes Clintiae, Sprekelia formosissima,* a large *Tigridia* which we presumed to be *T. pavonia,* cliff hugging *Tillandsia* species, and a little insect eating plant, *Pinguicula caudata,* a member of the butterwort clan, with lovely purple flowers looking much like a small pansy, but with a ''spur''-like affair similar to that of larkspurs. We decided to collect these on our way back home, but as things later developed, we were not able to do so. Fortunately for James, I was able to return to this area six months later and collect some of these odd carnivorous plants for him, since insect eating plants seem to be a very important part of his nursery business.

North of the city of San Luis Potosi we had also collected a plant of the *Manfreda* clan with tunicated bulbs having a large basal plate and succulent purple spotted or striped leaves. It appeared very much like our Texas *Runyonia tubiflora* which grows along our lower Rio Grande, and it could perhaps be that species or a related one. We also collected *Oxalis* in several forms and a pretty pinkish little *Allium* with membranous coated bulbs which sent forth stolons.

The end of the first day found us properly tired, but cleaning our day's ''haul'' in a nice motel just outside the City of Queretaro, where we were able to dine in a nice restaurant and reflect over the many things we had seen that day. The second day, Monday July 11th, found us on the road again, now on highway 55, with Toluca as our destination. The day was a busy one with many unusual plants being collected. All types of bulbous material were found, many of which we did not have the haziest idea as to their identity. James was very much impressed with a lovely colony of coral-red *Bravoa geminiflora* growing in grassy, rolling hillsides in the state of Mexico. Also growing with them was a beautiful golden yellow *Calochortus* species with the fragrance of honey. He was delighted with the beauty of the lovely yellow bells which enclosed those delicate hairs seen in many members of that genus. Mexican *Calochortus,* unlike their North American counterparts, grow and flower in the summer, during the rainy season, making them relatively easy to grow anywhere in cultivation. James also was enchanted with the many species of *Tradescantia* and *Commelina,* and collected the many kinds that grow with tuberous roots. Even the tuberous-rooted geraniums were fair game.

Toluca, as usual, was damp and cold, and our motel room was heated for us. The next morning found us still heading southward toward Taxco and the state of Guerrero. So rich was this country in interesting plant life that James was like ''Alice in Wonderland''. Tillandsias, Orchids, tuberous Begonias, *Oxalis* of all types as well as an endless variety of other bulbs kept us busy. A fine colony of *Oxalis deppeii* captured our attention. Not only were there the usual coppery-red forms, but also forms in deep rose and lavender as well. We began collecting those with more prettily marked foliage as well. Near the Guererro-Mexico state lines we found a large colony of small yellow flowered Tigridias in full flower. James photographed them while I dug some of the bulbs growing in very heavy clay soil that remained wet after rains. After getting all the pictures that he wanted, he helped me dig Tigridias, along with a terrestrial orchid of the *Spiranthes* group, and some other unidentified tuberous rooted things. A little later we dug a little *Milla* species just inside the Mexico State line. These were in full bloom on a limestone hillside. This proved to be the same as a collection that I had found in both 1964 and 65 in the state of Morelos, near Cuernavaca. I was pleased to find that it also grew here, near the Mexico-Guerrero state line. This little species, the smallest in the genus, has threadlike leaves, only 1 mm. broad, oddly fuzzy stems, and typical white flowers with green stripes on the reverse of each segment, as in *M. biflora.* We dug corms of this plant and added them to our growing collection. A few more miles southward and we were collecting another species of *Calochortus* which was not yet in flower, and *Tigridia meleagris,* that strange Irid that looks so much like a purple and gold *Fritillaria* when in flower. *Sprekelia formosissima,* various *Oxalis,* and a *Bomarea* were also found, along with various tuberous rooted Begonias and other odds and ends.

A few miles north of Taxco, James was to become acquainted with *Bessera elegans* and *Milla magnifica.* He was completely taken by the giant *Milla magnifica* and needed no invitation to add these to his growing collection of bulbs. A most unusual tuberous *Begonia* with a single flat ground-hugging leaf almost stole the show, however. The leaf was often as large as a dinner plate, from the center which arose one or more tall stems bearing light pink Begonia flowers of typical form. Neither of us had ever seen such a *Begonia.* Though tempted, we did not tarry in Taxco, but decided to drive to Iguala to spend the night, in the interest of saving time. Iguala, at a much lower elevation, was uncomfortably warm and we were only too glad to be on the road the next morning. Below Iguala, I again stopped to collect that weird little member of the *Milla* group which I had previously thought to be the long lost *Diphalangium graminifolia.* These were not yet in bloom, but I dug some specimens anyway. Since then, I have flowered this in cultivation and it now appears to be a new species in the genus *Dandya.* The little flowers nod gracefully in the loose umbel, as in *Bessera,* but the flowers are white, with reflexing segments. The effect is similar to a *Dodecatheon,* or ''Shooting Stars'' of the primrose family. Indeed the name, ''Shooting Star Lily'' has been coined for this plant, and the name seems appropriate.

In this same region we again collected the rare little dwarf *Sprekelia* species that I have previously collected in the area around the Oaxaca-puebla state lines in previous trips. These were not in flower, but the tiny bulb and leaf, no larger than a small *Habranthus,* were instantly recognizable to me. I have been able to flower this tiny jewel only once, in a pot, and the small spidery flowers are of typical *Sprekelia* form, although the segments are no wider than that of any *Hymenocallis!* This plant is currently under study by Dr. Traub at La Jolla, and may perhaps be described as a new species if it can be flowered.

We saw many colonies of several species of *Hymenocallis* in Guerrero, but did not collect any, as I had adequate stock from collections made in previous years. These included *H. Choretis* (*H. glauca*), *H. riparia* growing in and along streams, and a species yet to be described.

That night was spent in Acapulco, temporarily giving us a taste of ''civilization'' and the faces of American tourists again. But it did not last long, for we returned northward towards Iguala once more, collecting plants with a vengeance. We made several stops in the vicinity of Chilpancingo, finding many bulbs and plants of interest. We found a lovely colony of *Bessera elegans* which included the full range of its colors. The scarlet and coral-red shades predominated but there were a few purple or violet shades, and quite a few ''tricolor'' forms that were red on the outside and red-and-white with blue tips within! Later I collected that stunning yellow flowered Irid that is presumably a *Nemastylis* of some sort. Near the little village of Acahuitzotla, which the newer, present road has bypassed, we stopped to search for *Petronymphe decora,* a rare gem allied to *Milla* and *Bessera.* We never could find the ''rock nymph'' but we did find a host of other interesting plants including a purple *Achimenes* and another Gesneriad that we could not identify, along with several terrestrial orchids, *Bommrea.* A pretty *Oxalis* with velvety leaves, Begonias, and a beautiful purple and gold form of *Tillandsia capitata* clinging to the cliffs.

Another uncomfortable night in Iguala once again and then westward on a gravel road leading to Teloloapam, about 35 miles westward. For several years I had been seeking a little-known region in the state of Guerrero known as District Mina, where two very rare *Milla* species have been reported. . . . *M. delicata* (pink) and *M. mortoniana* (blue), neither of which is in cultivation. District Mina is said to be west of Teloloapam, near the Guerrero-Michoacan state lines, but is not easily accessible by automobile, as there are no paved roads, and the existing gravel and earth roads are rough. The road to Teloloapam quickly bounced us up into the mountains and we found many interesting plants. *Milla magnifica* was fairly abundant and we found one specimen with leaves over five feet long, almost as tall as James. A *Tigridia* with yellow buds showing grew there too, and it appeared to be a yellow form of *T. pavonia.* It was accompanied by *Sprekelia formosissima,* and an *Anthericum* of some sort, along with a *Manfreda.* Farther down the road we found *Hymenocallis riparia* growing in a stream and in full bloom. We collected another tuberous *Begonia,* and some *Tillandsias.* We finally bounced into Teloloapam and found it to be a most enchanting little town, completely unspoiled, with cobblestone streets, and an air of long-ago about it.

I would like to have lingered and investigated, but our trip there had bounced our brains loose and we both agreed not to continue any further westward towards District Mina on THIS trip, since it looked like it would require more time than we had bargained for. We turned about and bounced back toward Iguala once more, and where there was PAVEMENT. We stopped at Iguala long enough to enjoy a milk shake and hamburgers at an American-type drive-in. Quite a jazzy contrast from Teloloapam! From there we drove to Cuernavaca and then eastward to the Pan American highway. By evening we were at Huajuapan, in the state of Oaxaca, where we spent the night. The next morning found us collecting a pretty, small brown-flowered *Tigridia* that is not described as yet, and a very attractive dwarf white flowered *Anthericum.* Later that morning we collected a small blue flowered *Commelina* and a very attractive small *Tradescantia* with bright purple flowers. Another stop yielded a lovely golden yellow flowered *Sisyrinchium,* a pretty little xerophytic *Tillandsia* related to *T. plumosa,* and an attractive *Echiveria* species.

Nearing the City of Oaxaca, we found another exciting group of plants. One particularly, a *Milla* species, proved to be another undescribed gem which I had overlooked in previous years. Like so many botanists before me, I had incorrectly assumed it to be *M. biflora* without looking it over more closely. Another of the night flowering kinds, this new species would be yet another in the growing list of undescribed species in the *Milla* group. My sudden enthusiasm infected James as well, and he helped me in digging specimens. We collected other odds and ends, including Tillandsias, and bulbous Irids before entering the City of Oaxaca for rest and relaxation.

The next morning we took a side trip from the City on the road to Puerto Angel and back, collecting many interesting plants in the mountains. Once again we left pavement behind us and bounced our way onward over the rutted washboard surface. James hung onto the grab-bar on the dashboard for dear life and vibrated like a milkshake.

Our collections were very good and we found many things to interest each of us. I found a new species of Irid with purplish brown flowers which turned out to be another addition to the new genus *Fosteria.* We also dug *Sprekelia formosissima, Calochortus,* and a small Amaryllid that we could not identify, as it was not in flower, but which may be a *Habranthus* or *Zephyranthes.* James was elated when I discovered a strange little plant with white flowers and narrow leaves with bulbous bases. It was a species of *Pinguicula* with which he was unfamiliar, and a plant which he assured me had made the entire trip worthwhile, if he could get them home alive. Continuing further, we came across a colony of *Zygadenus* of some sort, with branched panicles of small greenish white flowers. This was my first encounter with this member of the Lily family in Mexico. Nearby we found quite a number of *Bomareas,* a climbing plant, in full flower and we took both tubers and seeds, hoping that maybe we could get some to live, as they are very difficult to dig what with the tubers being so brittle. I am still batting zero where *Bomarea* is concerned. The seed failed to germinate and the tubers did not survive. We began to find few bulbous plants of interest and only Tillandsias to keep us occupied, so we decided to return to the City of Oaxaca as it was beginning to get late.

The next day we drove southward to the town of Tehuantepec, collecting a few Bromeliads, but little else. Tehuantepec, like Iguala, is at a low elevation, and therefore tropical and uncomfortable. We were glad to get away from there and continue down the coastal highway to Tapachula and entry into Guatemala, stopping only to collect a few *Tillandsia concolor,* and bulbs of *Eustylis purpurea* and a pretty rose flowered *Oxalis.* We also observed that our little night flowering *Milla* from Oaxaca, and the stoloniferous *Milla* of Chiapas and Guatemala overlapped in the area near the Oaxaca-Chiapas state lines. We ate supper at Tapachula and headed for the Guatemalan border.

Entry into Guatemala went smoothly for a change, no doubt due to the fact that I agreed to accept a young naval academy student who was the son of a Guatemala City official as a passenger to Guatemala City. James was a bit leery of taking a stranger along, but his fears proved unwarranted. Our new friend proved to be engaging company, and a helpful hand when we experienced a flat tire the next morning. When we arrived in Guatemala City, our friend took us to his home, where we were introduced to his mother and sister. They proved to be a most gracious trio of hosts and hostesses. After being fed we were then taken on a tour of the market downtown where we were able to buy some of the beautiful textiles that Guatemala is world-famed for. The entire episode left us with a warm glow as we drove northward toward Mexico again. This time we would return through ''El Tapon'', the dreaded land-slide area that follows a river in a gorge between high mountains. But first we visited the lovely old Spanish city of Antigua, once ruined by a terrible earthquake, but now reconstructed and a ''must'' for tourists. The night was spent at Panajachel on the shores of famed Lake Atitlan. We observed several clumps of a very beautiful White flowered *Crinum* with large bowl-shaped flowers and chartreuse markings in the throat. Neither of us had ever seen this one before and I decided that I must have it. The Motel manager very graciously refused to accept any money for it and had an Indian, colorfully garbed in typical costume for that area, dig a few bulbs for us with a machete. Though we have not positively identified it, it seems that our new ''find'' is allied to *C. giganteum*, and might possibly be *C. virgineum*, a species rarely seen in cultivation, and not to be confused with the hybrid known as ''Virginicum'', which bears no resemblance to it.

Although Guatemala is a most beautiful country in every way, the parts that I have seen are no haven for bulbs, simply because of the excessive rainfall. The area around Huehuetenango is a bright spot though, as a very lovely *Milla* with nocturnal flowering habits and off-setting freely by underground stolons is to be found growing in grassy rolling pastures. This *Milla,* known as 64-95, will soon be described in a forthcoming monograph, which will include many new species.

Another Irid, *Orthosanthos,* with fibrous roots, and fan-like foliage topped by showy blue flowers, beckoned, and we took both seeds and plants. These failed to survive fumigation, and I am convinced that some of these things should be dipped rather than fumigated to prevent heavy losses. Our greatest surprise of the day came when we found a pretty pinkish flowered *Allium* in flower on a grassy slope. This was to be the first *Allium* reported from Central America, and has since been given the name of *Allium guatamalense* Traub. It is a fairly tall *Allium* with scapes over a foot high and numerous pinkish flowers with darker midribs in each segment.

The trip through El Tapon was uneventful, and it was obvious that the road was in far better condition than in 1964. I understand that it is now finally in the process of being paved, and should now be an easy trip for any motorist. The deep gorge abounds with Tillandsias and other epiphytic plants, and we stopped to collect *Tillandsia seleriana* and a few orchids. It was raining when we reached the Mexican border and we were rushed on through and before we knew it we were in Mexico again, heading towards Comitan for a night's rest. The next morning we drove a few miles South of the City to collect various odds and ends before driving northward again. A dazzling scarlet *Tigridia pavonia* with hugh 7″ flowers was sighted on the outskirts of a small village. I had never seen such large flowers in this *Tigridia* before, but James shattered my enthusiasm by stating that such large flowers in *Tigridia* were not unusual in cultivation in California! I was crushed.

Nearing the city of San Cristobal de las Casas, we stopped several times to collect several kinds of Tillandsias and epiphytic orchids, such as *Odontoglossum pulchellum,* as well as a *Tigridia* species with brown flowers. North of the City we collected several kinds of Terrestrial orchids, a large *Vriesea, V. wreckleana,* growing on rocky outcroppings above the roadsides in the mountains, and the usual odds and ends of miscellaneous material. We did not spend any time in Tuxtla Gutierrez stopping only long enough to eat, and then continued northward to Tehuantepec once more and another uncomfortable night in the humid tropics.

Time was beginning to run out on us as we headed homeward from Southern Mexico, and we were covering a greater number of miles each day and spending less time collecting, other than the obvious things that could be spotted from the car while driving. We continued taking our toll in epiphytic plants, namely Tillandsias and orchids of various kinds as we drove from Tehuantepec to Oaxaca and then northward to Huajuapan de Leon, where we took the recently paved Mexico 125 to Tehuacan, Puebla. A few miles South of Tehuacan, in fabulous cactus country, I re-collected 62-44, a nocturnal flowering, stoloniferous *Milla* species that I had first found in 1962. These were not yet in flower and I was able to transplant them safely in my garden where they continued growing and flowered late that same summer. A species of *Schoenocaulen,* and a strange liliaceous plant with white bell-shaped flowers and tuberous roots were dug in the same general area.

The next morning, a few miles out of Tehuacan, I became aware that I had been hit by dysentery. At first I supposed that it was only the usual thing that seems to hit every neophyte-tourist . . . jokingly called ''Turistas'', ''The Mexican Quick-step'', or ''Montezuma's Revenge''. I was not at all worried, since these things generally last only a couple of days or less. We had lunch in Mexico City, at a nice sidewalk cafe in a busy suburban area where we could sit and watch our car, which we thought to be locked. A group of men and women casually strolled past and paused, while talking, by our car, and then casually continued down the street. We did not realize it at the time, but we had witnessed our bags being lifted from the front seat of our car! They did not get anything other than the two bags which they could easily reach without being noticed, but one of these bags contained James' photographic equipment, including film and special lenses. Luckily they did not get his camera. But unluckily the bag also contained our tourist cards and car permit! This was to result in a day's delay and a ridiculous fine at the border. My bag contained various pills, etc. in the event that one of us became sick. Now that I needed these drugs, they were gone! We finally arrived in San Antonio, still bitter about the events in Mexico City and at the border, but with a car load of plants, and already talking about plans for future trips. Such is the way with explorer-botanists and plantsmen interested in botanicals out-of-the-ordinary.

II. 1967 EXPLORATION—JULY 23 THROUGH AUGUST 7, 1967

The writer has made a series of botanical trips into Mexico, still looking for new and rare bulbous material. I was accompanied on my ''big'' annual trip in 1967 by Les Hannibal, long known in round-robin circles and in the APLS as a breeder of Crinums and Brunsvegias, and an interested student of Amaryllids in general.

Mr. Hannibal arrived by jet, and we were off and away a couple of hours later towards the West coast of Mexico. Our first day was spent collecting plants in the state of Durango. I had made this phase of the trip twice before, earlier, in the summers of 1964 and 1965, so late-flowering things I might have missed before. I was on the look-out there was really very little new that I expected to find, other than a few for *Allium* species though, as the area seemed to be rich in them. Our first species was found East of the City of Durango and was the same plant I had collected in 1964 and 65, with underground stolons. These were all in the bud stage, but I knew the flowers to be pinkish. A few miles closer to Durango City, I spotted what looked like another *Allium* in full bloom, growing in wet roadside ditches. This was a new species to me and we dug bulbs and placed several flowering plants in the plant press that I had taken along with me for such an event. These Alliums grew in clumps, increasing only by division and had large umbels with white flowers with a faint pinkish midrib to each segment. The soil in which they grew was heavy greyish clay. This *Allium* was given the number 67-14 for identification purposes.

Milla biflora was in full bloom everywhere, and many fine specimens were collected for study. At kilometer 1054, I spotted a most unusual member of the *Manfreda* group and their allies, with brownish bell-shaped flower on tall wiry stems. Neither of us had the foggiest idea what it might be. Individually the flowers reminded us of the bells of some Fritillarias.

South of Mazatlan the following day, we found ourselves in lush rolling country where *Bessera elegans* is at its best, in all its colors which include the usual scarlets as well as carmines, rose-shades, and purples. Mosquitoes here were terrible and I was forced to wear a plastic raincoat and a towel over my head to keep from being bitten. This in spite of the fact that I had sprayed myself heavily with a repellent! Nearing Tepic, we found ourselves out of the mosquito area and we could make our collections in a more comfortable fashion. By evening we were in the eastern portion of the State of Nayarit, and I spotted *Hymenocallis horsmannii* in a cultivated *Agave* field among volcanic rocks. With it grew *Sprekelia formosissima* in the powdery black volcanic soil and we dug these, since some of them had foliage very heavily pigmented with red in the lower portions.

The following day we continued collecting plants into the state of Jalisco, stopping in Guadalajara for lunch before driving southward toward the coast. Poor Les had already suffered a short bout with the "Turistas" and I proclaimed him to be formally initiated. Little did either of us know that he was not to get off so lightly nor did we suspect that he would take a "souvenir" gastro-intestinal infection home with him.

Our morning collections had been very successful, what with finding another *Allium* species, 67-35, growing in a roadside ditch about a mile west of Magdalena, Jalisco, along with a very fragrant pinkish white relative of our garden tuberose. We did not know if it was a *Polianthes* or perhaps a *Bravoa,* since *Bravoa* is sometimes given as a synonym for *Polianthes.* At any rate it seemed quite garden-worthy and since I could not identify the plant I took no chances that it might not be a new species. I have long since learned not to assume that a new plant can be identified every time. Many of them are still undescribed. which is why we continue collecting and making field trips.

Below Autlan, Jalisco, on Mexico 80, we stopped to collect *Bravoa geminiflora,* and found a stunning brown-and-gold *Calochortus* species in full bloom. The pendant bells were produced in amazing abundance from each plant, with many buds and flowers showing. It is noteworthy that many of the bulbous plants of Mexico have flower-forms or habits to protect their pollen from the frequent summer afternoon showers. Many flowers are nodding and bell shaped, as seen in some of the *Calochortus, Bessera, Petronymphe,* and some Tigridias that remain open in the afternoons. Others are nodding and tubular, such as seen in *Polianthes, Bravoa,* and *Manfreda.* Even the terrestrial orchids tend to surround their lips with their segments in order to protect their pollen. *Zephyranthes* solve the problem by closing when suddenly shaded by a cloud. *Hymenocallis* try to avoid the problem all together by waiting until the afternoon showers pass before opening in the late evening. Many *Milla* species simply remained closed during the day, reopening each night. *Hymenocallis, Sprekelias, Habranthus,* and *Zephyranthes* get their flowering done with the first rains of the season before the really heavier rains follow later. Some of the Irids flower early in the morning or late in the evenings when they are less likely to be rained on. Over and over again, these bulbous plants each develop habits or flower forms to insure that they will be able to protect their pollens, and therefore their futures.

We found *Hymenocallis azteciana* Traub, flowering below Autlan and dug a few of these along with a very large species of *Bravoa* with broad shiny green leaves and red flowers. By this time it was afternoon and raining, and we did little more collecting. The rains finally stopped and we had almost reached a little village known as La Huerta when it happened. A strange clatter in the engine told me that I had serious motor trouble and I stopped the car and waited for someone to come along to tow us. Someone did. We spent the next four days in La Huerta while our engine was removed, taken to Guadalajara, completely disassembled, parts machined and replaced, and then thoroughly cleaned. It was returned to La Huerta where our mechanic, a genius in my book, put all the little parts back together again and then returned the motor to the car. We still have a sneaking suspicion that he took it completely apart just to see what made the little Volkswagen engine "tick". But no matter, his services were only forty dollars American, not including the parts and machine work done in Guadalajara. In essence I had a new motor.

Meantime we had much time to kill, and nothing to do. The only cafe fit to eat in was filled with buzzing flies from morning until sundown. The menu left much to be desired for in the way of variety, though the food wasn't bad, if you are accustomed to Mexican food as I am. Les was not, and the pounds were dropping off him daily. A big man and hearty eater, he was eating so little that I had to goad him into eating lest he become weakened from fasting. The many miles, and strange foods were beginning to wear on him. He was terrifically bored from the many days of doing nothing. I did not blame him. Nothing is worse than being stranded in such an uncomfortable place and in such an uncomfortably hot climate, when one's days and funds are limited, and when one's plans are being altered. The last two days we managed to hire a man to take us into the mountains north and south of the village in his pickup truck to collect plants. It helped soften the grim situation and gave us something to do.

At last our car was ready, (about midnight), running like a Swiss watch, and we prepared to leave the next morning. It was with elation that we bade La Huerta farewell, and drove first to Manzanillo and then the city of Colima, Colima, where we ate lunch. The morning's collection had been very good, as we had found a *Hymenocallis* with glaucous leaves, which may or may not be anything new, and a colony of stunning fuchsia-purple *Bessera.* These were the finest that I have seen in this shade, and I was not certain if this was simply a variety of *B. elegans* or perhaps a new species, but I finally decided that it really was only a variety, since there were no physical characters that were unique enough to easily distinguish it from *B. elegans,* when seen as a dried specimen. I stopped again to collect a little *Milla* species that I had found in 1965. I have yet to see it in flower though I have collected it in different months. It is a new species, I feel sure, but it must flower very late. Other collections were made along the way, but nothing that was new from the 1965 trip.

We spent the night in Zamora, Michoacan, and the next morning the auto was giving us trouble again. I got a mechanic to check it and found that we needed new points and a new ignition coil. By noon we were on the road again, heading down Mexico 37 towards Uruapan and then the coast. Les was in better spirits and we made several collections before reaching a small cross-roads cafe and gas station know as Cuatro Caminos, and the road to the Michoacan coast, only half of which is yet paved. At kilometer 165, about 10 miles south of Cuatro Caminos, in gritty red volcanic soil on a dry hillside facing east, I found it. A lavender-blue flowered member of the *Milla* family, and obviously a species of *Dandya.* Indeed it resembled the line drawing of *D. purpusii* shown in Dr. Hal Moore's monograph on ''The Genus *Milla* and its Allies'', and which had been made from a dried specimen. It also greatly resembled the new little white *Dandya* species from Guererro, with the ''shooting star'' appearance, except that the flowers did not nod in the umbel, nor did the segments reflex. Corms were dug, though they were not plentiful, and specimens were placed in the plant press to dry.

Shortly after that our pavement ended, but we proceeded onward to the little town of Arteaga, about 45 miles from the coast. The little town was a delight, unspoiled by tourists, and charming in every way. Our hotel room was comfortable, and there were flowers everywhere. Things would have been great had Les not had another attack of the ''turistas'' during the night. This time he could not get rid of it. We drove back towards Cuatro Caminos the next morning, and stopped a few times to collect various Amaryllids along the way. One was a glaucous leaved *Hymenocallis* in leaf only, and a real find was *Sprekelia clintiae* with the glaucous blue-green leaves. Though known in cultivation, this plant was not known from the wilds, at least not officially. A somewhat similar *Sprekelia* had been collected near Morelia, Michoacan by Mr. and Mrs. Clint, Walter Flory and Ray Flagg, but these had coarse glaucescent foliage, and were most likely variants of *S. formosissima,* whereas this plant had pretty glaucous foliage and a rather dainty overall bearing.

Many miles of unpaved road later, found us back in civilization at Patzcuaro, Michoacan where we had supper, before driving on to Morelia for the night.

The next day we drove to Toluca, picking up more *Bravoa geminiflora* and a little stoloniferous *Allium* along the way, among other things. We were heading homeward again, and we spent the following night in Guanajuato. Les was still plagued with his gastro-intestinal problem, but he was learning to live with it and was eating more heartily. The next day we drove out of the states of Guanajuato and Jalisco, and into the state of San Luis Potosi, collecting a variety of bulbous plants enroute. These included a new *Milla* species, 67-64, *Habranthus,* two kinds of *Calochortus,* a most variable *Milla biflora* colony and an *Allium.* The next day we drove from the City of San Luis Potosi to Cd. Victoria, and collected yet more material and also stopping long enough to get our plants cleaned and in order.

We entered the United States through Brownsville, taking time to visit with Mrs. Morris Clint, Mrs. Helen Winans, and Mrs. Sulema Etchison, all extremely fine gardeners in their own right, and all interested in Amaryllids and bulbs of all kinds. These visits were a highlight of our trip and gave us time to unwind from the hectic pace in which we were once again reminded to expect the unexpected.

Wheeler—**AMARYLLIS STRIATA,** continued from page 112.

My pollinating activities have produced a lot of seeds during the past several years. Lacking both the time and facilities to plant them I have sent them to my correspondents in Japan, the Netherlands, and the Republic of South Africa, for whatever use they might be to those persons for the improvement of the genus. As yet I have heard of no blooms from the crosses but there should be reports in the not too distant future.

PLANT GROWTH, FLOWERING AND FRUITING IN GYPSOPHILA OLDHAMIANA L.,

FOLLOWING SEED TREATMENT WITH P^{32}

S. Bose and A. Hati

Dry seeds of *G. oldhamiana* (Sutton's) were treated for 24 hours with P^{32} solution the dosage being 0.2 uc per seed. Control seeds were kept in water for the same length of time.

Germination was noticed first in seeds treated with P^{32} and two days later in control. There was not much difference in the range of germination period of the control and treated seeds. The percentage of germination and the survival of plants till maturity was highest in control and lowest from P^{32} treatment. Mean of plant height in the plants originating from P^{32} treatment was much lower than in control. Mean number of branches were greater in the plants originating from P^{32} treatment and likewise there was increase in the number of leaves here. Flowering was noticed first in control and a week later in the plants originating from P^{32} treatment. Number of flowers per plant was also highest here. There was great variation in the size of pollen grains and pollen sterility was also highest in the plants originating from P^{32} treatment. The percentage of fruit set and the number of seeds per fruit was, however, lowest here (Table 1).

Table 1. Effect of P32 on **Gypsophila oldhamiana** L.

Observations; Treatment	Control	P32
No. of seeds per treatment	100	100
No. of seeds germinated	59	20
No. of plants surviving till maturity	55	13
Percent of control	100	25.6
Plant height (cm)	28	22.5
No. of branches per plant	9	12
No. of leaves per plant	43	55
No. of flowers per plant	32	36
Range of flowering period (days)	8	11
Percentage of pollen sterility	12.3	72.8
Percentage of fruit set	80	30
No. of seeds per fruit	9	2

Crosses attempted between treatment x control and the reciprocal showed no seed formation while control x control plants showed 50 per cent seed formation.

Sincere thanks are due to Prof. P. K. Sen, Khaira Professor and Head of the Department of Agriculture for his interest and for providing facilities during the course of this investigation, and to Dr. A. K. Sharma, Reader, Department of Botany, for kindly supplying P^{32}.

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NEW GUATEMALAN AND MEXICAN ALLIUMS

HAMILTON P. TRAUB

In the first report (Traub, 1967), *Allium howardii*, from Edwards County, Texas, was named, and plants which Dr. T. M. Howard had collected in the State of Hidalgo, Mexico, were identified as *Allium glandulosum* Link & Otto. This report was based on bulbs collected by Dr. Howard up to 1966 in southern Texas, Mexico and Guatemala, and were turned over to the writer for identification. In 1967, Dr. Howard made two trips into Mexico, and again brought back *Allium* bulbs. Some of these are identified, or are named as new, in the present report.

SECTION **RHOPHETOPRASON**, GENUS **ALLIUM** L.

Prior to 1967, the process of vegetative reproduction in the two Mexican species, *Allium glandulosum* Link & Otto, and *A. longifolium* (H.B.K.) Spreng, was not understood. In observations made at La Jolla, it was determined that flowering-sized bulbs are produced terminally on usually long rhizomes, *the old bulbs not persisting,* as shown in Fig. 26. On the basis of this very distinctive feature, the Section *Rhophetoprason* was proposed (see Traub, 1967, p. 110).

There are also two other species (*Allium bolanderi* and *A. unifolium*) which increase by a somewhat similar process, but these species have different bulb coat characters, and they are therefore retained under Subsection *Bolanderiana,* Section *Lophioprason,* at least for the present.

IDENTIFICATION OF PREVIOUSLY NAMED SPECIES

In the past, four *Allium* species had been named from Mexico:

(a) *Allium kunthii* G. Don (1827), syn.-*Schoenoprasum* lineare H.B.K. (1816)

(b) *Allium longifolium* (H.B.K.) Spreng. (1825) syn.-*Schoenoprasum longifolium* H.B.K. (1816)

(c) *Allium scaposum* Benth. (1840)

(d) *Allium glandulosum* Link & Otto (1841)

As already indicated, *Allium glandulosum* has been collected by Dr. Howard in the State of Hidalgo and thus this species has been verified. In 1966, he also collected a form of it in the State of San Luis Potosi (Howard 66-3B). This plant is within the species range.

This still leaves three formerly described species to be verified. In order to assist collectors, photocopies of three of the (name-bearing) specimens are reproduced in this article. Through the kindness of the Director, Herbarium, Museum of Natural History, Phaner. Paris (P), photocopies were obtained of the name-bearing specimens of *Allium kunthii* G. Don, and *A. longifolium* (H.B.K.) Spreng., and these are reproduced in Fig. 27. A photocopy of the nomenifer specimen of *Allium scaposum* Benth., was received through the kindness of Dr. George Taylor, Director, Royal Botanic Gardens, Kew, Herbarium (K), and this

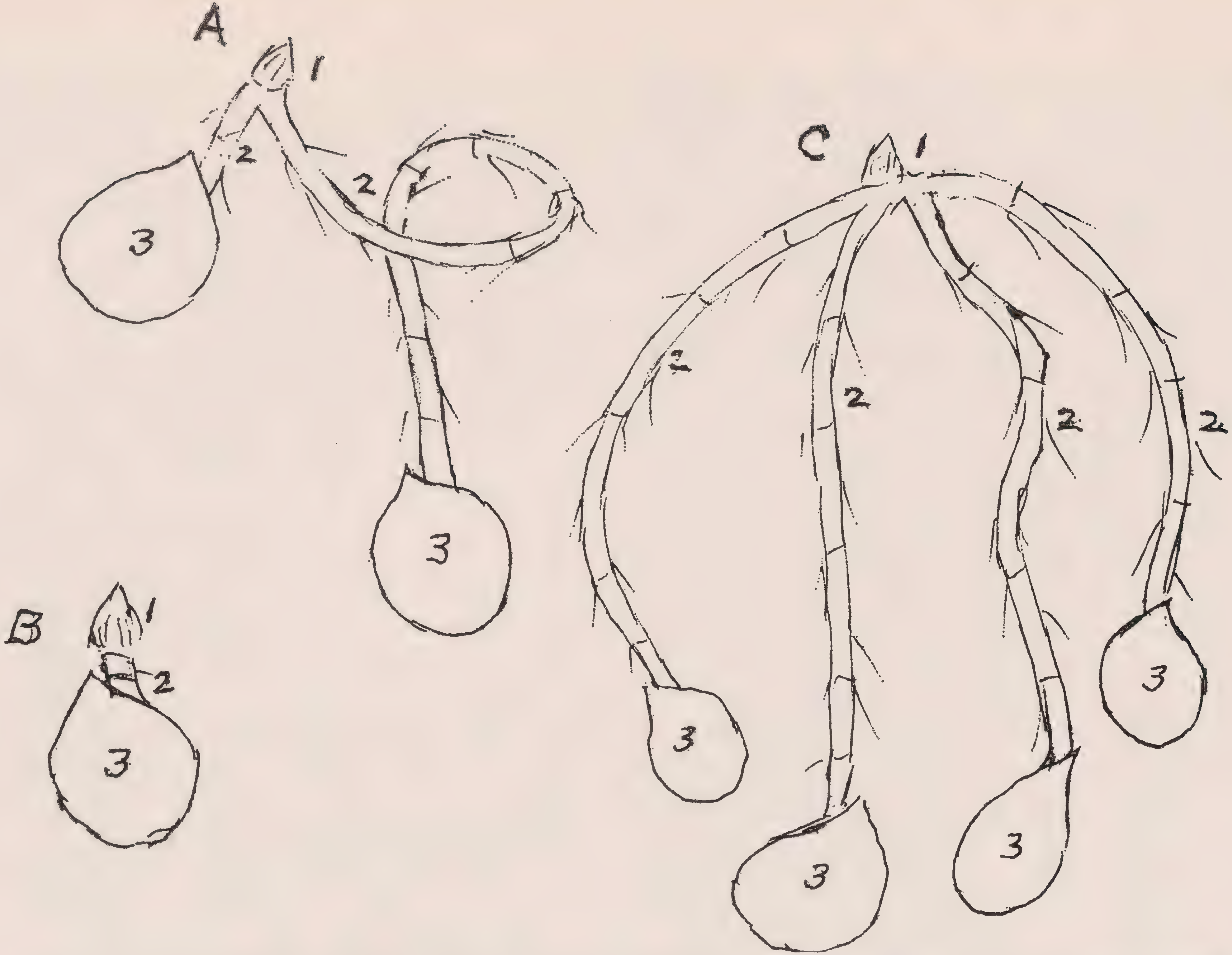

Fig. 26. Line drawings (approx. natural size) showing the type of asexual reproduction in **Allium longifolium** (H.B.K.) Spreng. **A,** self-fertile plant, **B,** male-sterile plant; and **C, Allium glandulosum** Link & Otto, self-fertile plant; pot grown plants.

A-1, B-1 and C-1, dead vestiges or remnants of the old bulbs. A-2, B-2 and C-2, rhizomes between the vestiges and the terminal bulbs, A-3, B-3 and C-3, which are flowering sized. Grown at La Jolla, Calif. 1966.

is reproduced in Fig. 28. In addition, we are indebted to Dr. William T. Stearn, Department of Botany, British Museum, Herbarium (BM), for a photocopy of an isonomenifer of *A. scaposum*, which is shown in Fig. 29. With these as a background, it is hoped that the three previously described species can be verified by comparison with living plants collected, or to be collected in Mexico by Dr. Howard.

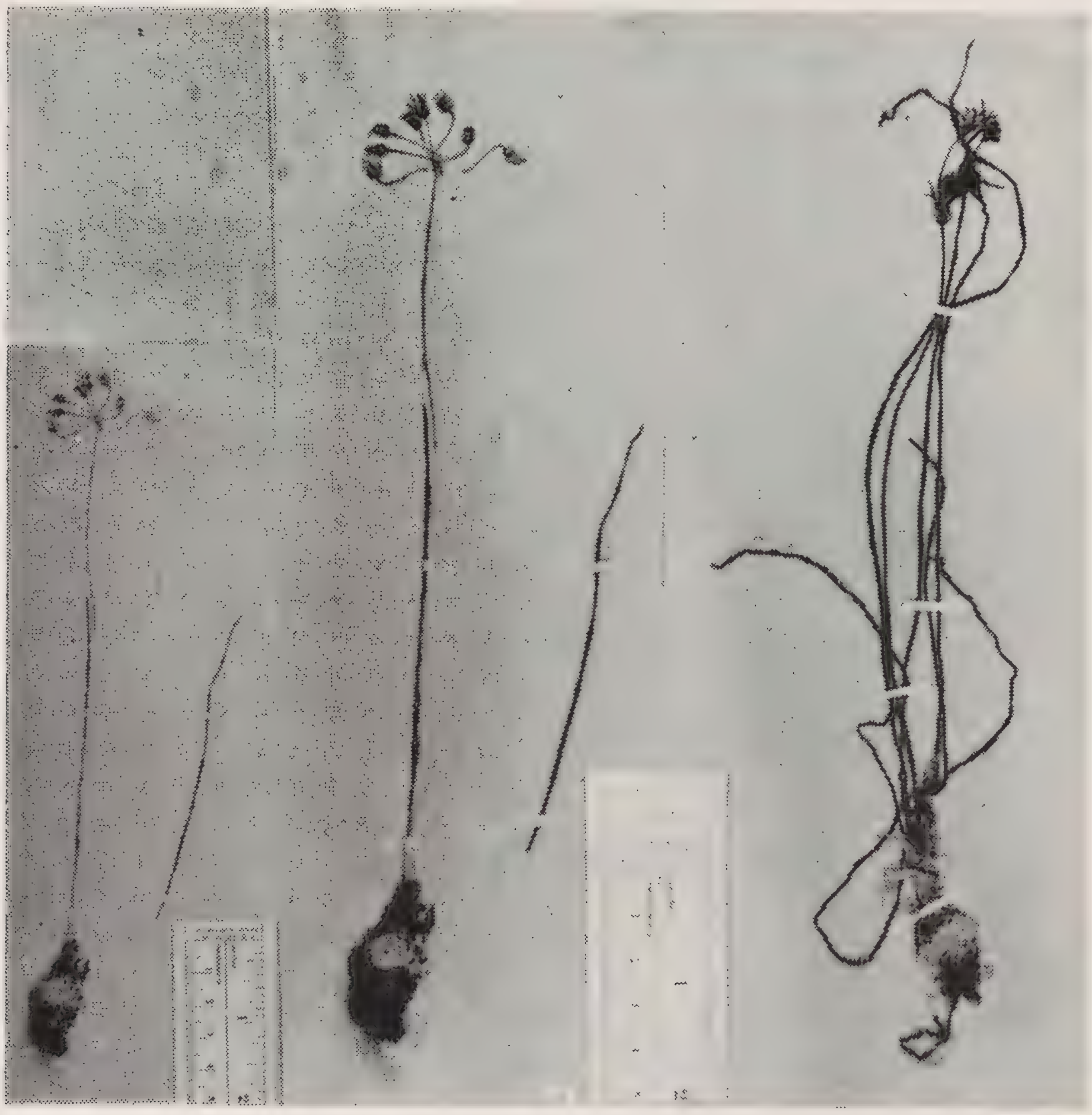

Fig. 27. Composite (note scales) from negatives furnished by courtesy of the Director, Herbarium, Mus. Nat. Hist. Phaner. Paris (P), Humboldt & Bonpland Herbanium. **Left, Allium kunthii** G. Don (syn.-**Schoenoprasum lineare** H.B.K.), the **holonomenifer specimen,** from contact print, note darkened background; **Middle,** the same, slightly enlarged, with background somewhat cleared up; plant approx. 18 cm. high. **Right, Allium longifolium** (H.B.K.) Spreng. (syn.-**Schoenoprasum longifolium** H.B.K.), the **lectonomenifer specimen.** Note **immature rhizome** protruding from bulb base; and **very long** leaves hard to manage on the herbarium sheet.

VERIFICATION OF **ALLIUM LONGIFOLIUM** (H.B.K.) SPRENG.

With the help of collections made by Dr. Howard, a second species, *Allium longifolium* (H.B.K) Spreng., has been verified during 1967.

An inspection of the lectonomenifer specimen of *Allium longifolium* (see Fig. 27) shows first of all that there is an *immature rhizome* protruding from the base of the bulb, and the leaves are very long and hard to manage on the herbarium sheet. Earlier American workers were thrown off the track by confusing this *immature rhizome* with a *root,* not realizing that the roots of North American Alliums are not that thick; they are usually quite thin. In *Nothoscordum bivalve* (L.) Britton also they are always thin. Thus, the *immature rhizome* and the very long leaves were dismissed and the few-flowered umbel with pedicels of unequal length (see Fig. 27) were emphasized and confused with the umbel in *Nothoscordum bivalve.* This in spite of the fact that the pedicels of that species when in flower are not markedly unequal in length, but often elongate considerably *after anthesis* resulting in contrasting unequal pedicel length in fruit. But this feature is not always constant for sometimes the pedicels after elongation are subsimilar in length. Having thus gone astray, former American workers rejected the lectonomenifer specimen as shown in Fig. 27, and unrealistically hoped to locate a different specimen. Under the conditions, this was a hopeless wish, and it led to a stalemate from which we are only now extricating ourselves by recognizing the facts in the case.

Dr. Howard has collected specimens of *Allium longifolium* in two locations—Jalisco (H 67-35) and in Michoacan (H 57-11B and H 64-57A). The former is a plant which matches the holonomenifer in size, and the latter is a little larger plant, but apparently belongs to the same species. On the basis of these, an emended description has been made of *Allium longifolium* and is published in the present report. Thus, we can rest assured that this species has at long last been verified. This leaves only two previously described Mexican species to be verified—*A. kunthii* and *A. scaposum.*

ALLIUM KUNTHII AND A. SCAPOSUM

Up to the present, these two species have not been verified by means of living plants, but Dr. Howard is planning to collect in the nomenifer localities indicated by Humboldt & Bonpland for *A. kunthii* in the early 19th century in central Mexico; and in the indicated habitat of *A. scaposum* in the State of Aguascalientes. These explorations should yield plant material for clearing up this problem. In the past, *A. scaposum* (Figs. 28 and 29) has been considered as a synonym of *A. kunthii,* Fig. 27 (Ownbey, 1950; Traub, 1967) in spite of the fact that *A. scaposum* is a much larger plant, and quite different from *A. kunthii.*

REVISION OF SUBSECTION **MEXICANA**, SECTION **AMERALLIUM**, AND SECTION **RHOPHETOPRASON**

Up to very recently, only four *Allium* species had been described from Mexico, and none from Central America, and these four were usually grouped under only two recognized species names. With the present report, the number of recognized species has been markedly increased, and includes even one from Guatemala. This requires an explanation. [*Allium glandulosum* has been collected in Honduras.]

The *Allium* species of Mexico are in the most part summer and autumn flowering plants, and unless they are collected during these seasons, many of them may be missed. This explains why in the past, the Mexican Alliums have been neglected. Collectors usually made a single

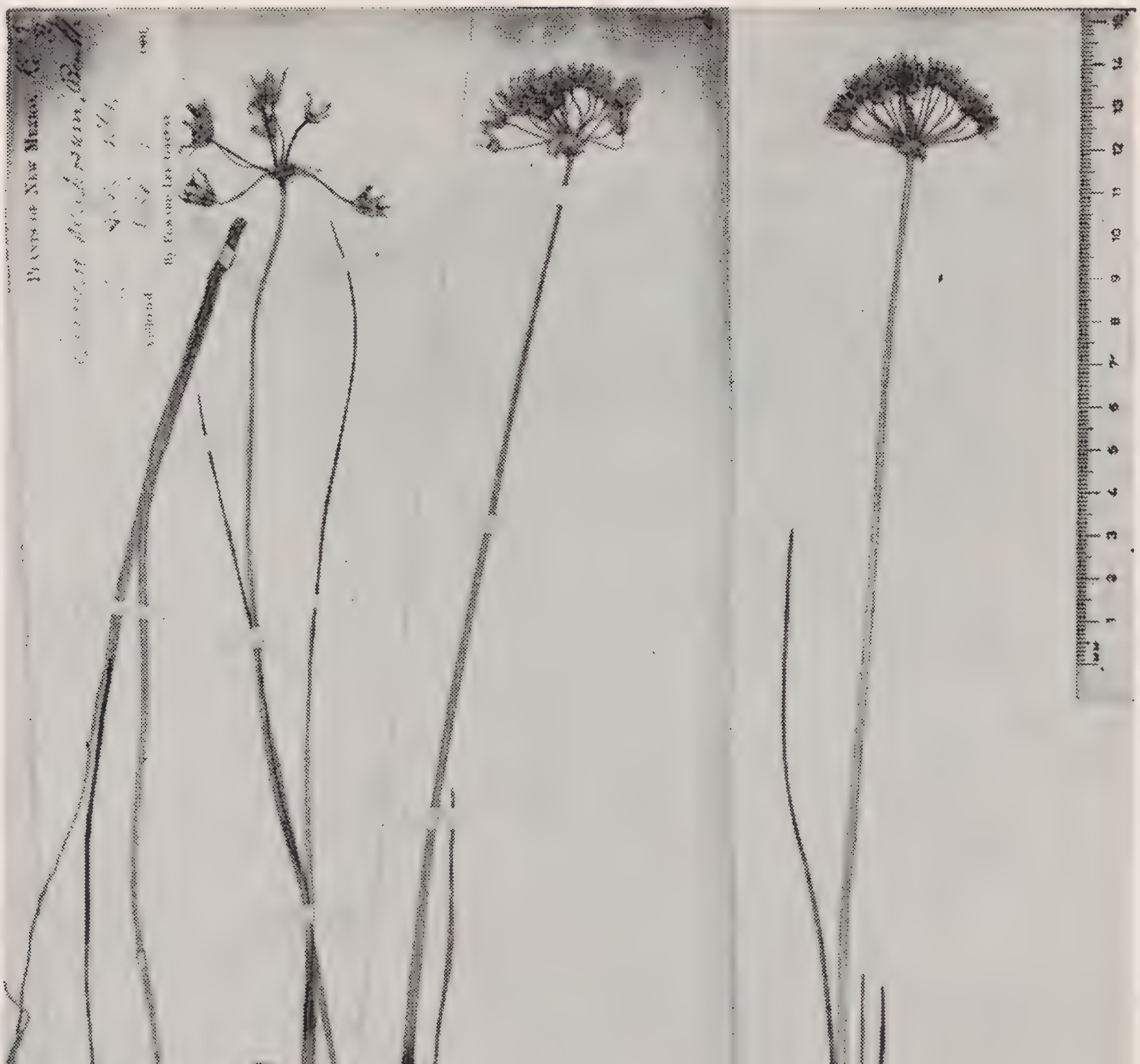

Fig. 28. Composite (note scale) from photo-print furnished by courtesy of Sir George Taylor, Director, Royal Botanic Gardens, Kew, Herbarium (K). (A) **Allium scaposum** Benth. in Herbarium Benthamiana, Hartweg no. 234, Aguascalientes, Mex., annotated in Bentham's handwriting, the **holonomenifer specimen;** plant approx. 64 cm. high. (B) **A. scaposum** Benth., in Herbarium Hookeriana, Hartweg, Zacatecas, Mex., tops of leaves missing. (C) **Allium** sp., not **A. scaposum** Benth.; Edward Lee Greene, Pinos Altos Mts., Grant County, New Mex., Sept. 16, 1880, a small plant with leaves subequaling or surpassing the scape; leaf at left spirally twisted (see under magnification); short, immature non-scaly rhizome at base of bulb; apparently **A. durangoense** Traub.

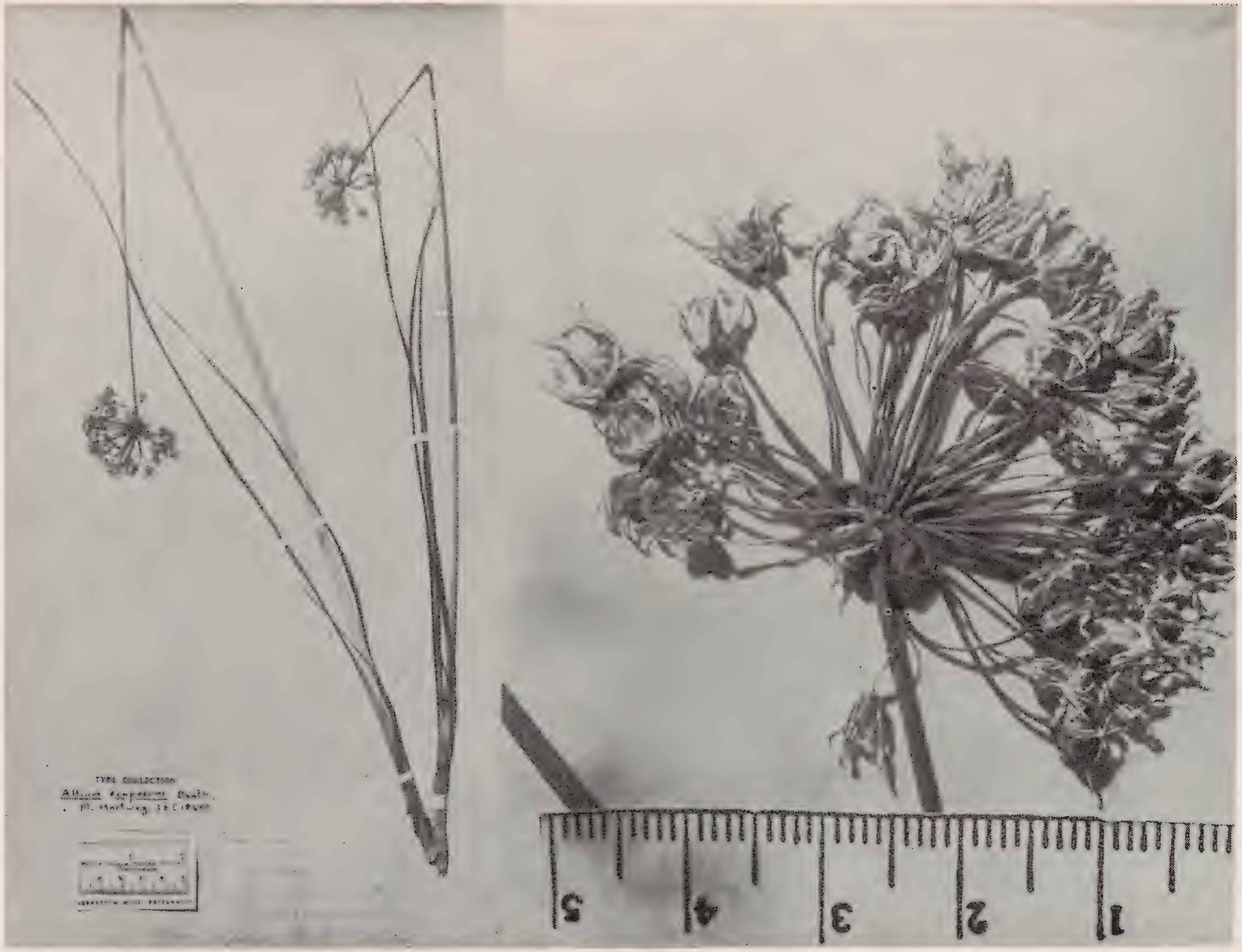

Fig. 29. Composite (note scales) from photoprints furnished by Courtesy of Dr. Wm. T. Stearn, Department of Botany, British Museum (BM); **Left, Allium scaposum** Benth. isonomenifer specimens. **Right,** umbel, enlarged.

trip in the spring or early summer and thus the Alliums were rarely found. Dr. T. M. Howard, who has collected bulbous plants in Mexico and Guatemala since 1957, has usually made more than one collecting trip in each year, and thus has found many undescribed plants in such a group as the Tribe *Milleae,* and incidentally also Alliums.

Although a goodly number of Mexican *Allium* species are now recognized in the present report, it is to be expected that still more will be found. Such regions as San Luis Potosi, with many mountain valleys, appears to be particularly rich in *Allium* species. Various other regions have not been explored for Alliums.

The present report is a continuation of the previous one (Traub, 1967, pp. 88-95; 110), and includes the species recognized since 1967. In the case of species previously described, references to the last best descriptions are given.

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Traub, Hamilton P. Subsection *Mexicanae* of Section *Amerallium.* Plant Life 23: 88—96; 110. 1967.

KEY TO THE SPECIES OF SUBSECTION **MEXICANA**, SECTION **AMERALLIUM**; AND SECTION **RHOPHETOPRASON**

1a. Plants multiplying by means of seeds, bulb division, or bulblets on short, or longer rhizomes, the old bulbs persisting:

SUBSECTION **MEXICANA**, SECTION **AMERALLIUM**

2a. Plants multiplying by means of seeds only:
 3a. Plants tall, robust, up to 90 cm. tall:
  4a. Flowers broadly campanulate, tepals 9 mm. long, whitish with deep lavender mid-vein; pedicels thick, 2 mm. in diam., somewhat discoidally enlarged at the apex; leaves 4.5 mm. in diam. (Guatemala) .... 1. **guatemalense**
  4b. Flowers campanulate, tepals 6.5 mm. long, whitish with red mid-vein; leaves linear terete (Mexico: Aguascalientes) .. 2. **scaposum**
 3b. Plants intermediate (to 18 cm. long) to small:
  5a. Umbel more than 5-flowered; plants glabrous, leaves narrowly-linear:
   6a. Spathe 7—9 mm. long; leaves narrowly-linear, straight; flowers whitish, red mid-vein (Central Mexico) .... 3. **kunthii**
   6b. Spathe 1.2—1.6 cm. long; leaves 2, spirally twisted; 2 mm. wide; pedicels **unequal** in length, 1.5—2.2 cm. long; flowers campanulate, tepals pink, deeper mid-vein (Durango) 4. **huntiae**
  5b. Umbel 2—5-flowered:
   7a. Umbel 5-flowered; leaves 2—3, spathe 1.7 cm. long; pedicels 1—1.4 cm. long (Mexico State of Puebla) ...... 5. **pueblanum**
   7b. Umbel 2—3-flowered; leaves 2, spathe 7—8 mm. long; pedicels 6—10 mm. long (State of Mexico: Telapon) .... 6. **telaponense**
2b. Plants multiplying vegetatively by bulb division, or by means of bulbs produced terminally on rhizomes, the old bulbs persisting:
 8a. Plants multiplying vegetatively by bulb splitting:
  9a. Roots **coarse,** to 3 mm. thick; umbel 8—12-flowered; flowers

campanulate, tepals lavender, with deep purple or blackish mid-veins; bulbs long-oblong (Mexico: Tamaulipas) .... 7. **mexicanum**

9b. Roots fine:

10a. Leaves smooth, light green, not ridged on back:

11a. Flowers white, tepals spreading, leaves 4—6 (Texas: Edwards County) .... 8. **howardii**

11b. Flowers white to pale pink, keeled green or purplish; leaves 2—3 (Mexico: Durango) .... 9. **mannii**

10b. Leaves 3—, or more, ridged on the back:

12a. Plants not denticulate; 3-ridged on back (Mexico: Nuevo Leon, Chihuahua State line) .... 10. **traubii**

13a. Umbel few-flowered, in autumn; leaves narrow, 2 mm. wide .... 10a. **traubii** forma **traubii**

13b. Umbel many-flowered, in summer and autumn, leaves 3 mm. wide .... 10b. **traubii** forma **liberflorens**

12b. Plant denticulate; leaves 5—6, 18 cm. long, 4.5 mm. wide, broadly canaliculate, 6—8-ridged on the back, denticulate on the ridges and leaf margins; scape flattish, denticulate on its ridges (Mexico Nuevo Leon) .... 11. **ownbeyi**

8b. Plants multiplying vegetatively by means of terminal bulblets on very short or longer rhizomes, the old bulbs persisting:

14a. Rhizomes scaly, 2—3 cm. long; leaves 2—3 mm. wide, very finely serrulate (New Mexico: Gila Hot Springs) 12. **rhizomatum**

14b. Rhizomes not scaly:

15a. Bulblets borne on very short rhizomes; umbel 10—30-flowered in autumn; tepals pale with purplish or pinkish mid-vein; leaves 1—2 mm. wide (South Texas) .... 13. **elmendorfii**

15b. Bulblets borne on longer rhizomes:

16a. Leaves not subterete:

17a. Leaves not spirally twisted:

18a. Leaves canaliculate:

19a. Bulbs very small, 6 mm. long, 4 mm. in diam; leaves 2—3, very narrow (Mexico: Michoacan) 14. **michoacanense**

19b. Bulbs larger, 1.5 cm. long, 1 cm. in diam.; leaves 4—5, green, 3—4 mm. wide (Mexico: San Luis Potosi, Valle de los Fantasmos) .... 15. **fantasmosense**

18b. Leaves flat (San Luis Potosi) .... 16. sp. (H 67-87B)

17b. Leaves spirally twisted, 3—5, upright, 2—2.5 mm. wide, canaliculate; umbel 9—23-flowered; flowers broadly campanulate to almost stellate, tepals whitish, keeled reddish-brown, ovary pinkish (Mexico: Durango) 17. **durangoense**

16b. Leaves subterete, very long, light green, very slightly channeled on top (Mexico: San Luis Potosi) 18. **subteretefolium**

1b. Plants multiplying by means of seeds and bulbs produced terminally on long rhizomes, the old bulbs not persisting:

SECTION **RHOPHETOPRASON**

20a. Flowers brownish-red (mahogany), tepals spreading; leaves several sheathing below, upright, shallowly canaliculate, prominently striated on both sides; scape flattened, striated; umbel many-flowered (Mexico: Hidalgo, San Luis Potosi and Honduras) .... 19. **glandulosum**

20b. Flowers campanulate, whitish to light lavender, tepals with deeper mid-vein; leaves smooth, thick, very long with tendency to lodging; umbel usually few-flowered in nature, but sometimes many-flowered under optimum culture; pedicels often unequal in length (Mexico: Michoacan & Jalisco) .... 20. **longifolium**

SUBSECTION **MEXICANA**, SECTION **AMERALLIUM**

Subsection **Mexicana** Traub, **subsect. nov.,** Sect. **Amerallium,** genus **Allium** L.; in Plant Life 23: 90—95. 1967.
Tunicae bulborum membranaceae, fibris sparsis verticalibus; bulbis rhizomas terminantibus in reproducto diffissis; vel reproducto vegetativo nullo. Typus: **Allium mexicanum** Traub.

1. **Allium guatemalense** Traub, **sp. nov.,** Plant Life 23: 90. 1967, **anglise.**

Planta robusta, bulba globosa, tunicis membranaceis, per semines reproducta; foliis 6—7 longis rectis infra vaginatis; scapo subcomplanato, supra subterete; umbella multiflora; floribus pro ratione magnis late campanulatis; pedicellis crassis ad apicem paulo discoideo-turgidis; ovario 6-cristato; capsula perobscure cristata; seminibus globoso-angulatis 2.5 mm. diametro.

Holonomenifer: Traub No. 1071(TRA), grown at La Jolla, Calif. July 27, 1967, from bulbs collected by Dr. T. M. Howard, No. 66-124, July 11, 1966, south of Huehuetenango, Guatemala.

Plant robust, to 30 cm. tall, or taller, in nature (to more than 90 tall with optimum culture at La Jolla, Calif.) *Bulb* globose, 2 cm. long, 1.9 cm. in diam in nature (and 3.2 cm. long, 3 cm. in diam, under optimum culture at La Jolla, Calif.), deeply seated in the soil (to 3.5 cm.), outer bulb coats membranous, very dark brown (almost black), inner bulb coats white, with widely separated vertical fibers; after the first set of leaves around the scape decline and fall away, a new sprout with 2—3 leaves, sheathing below, appears next to the scape from the base where the new bulb forms. *Leaves* 6—7, gray-green, upright, the older declining as new ones are formed, at flowering time most of the leaves have declined, and a new central sprout appears and persists into autumn (see under bulb above); the first set of leaves are rather thick, channeled above, rounded on under side (10—15) —21—30—36—40—50 cm. long, 4—5 mm. in diam., sheathing below to form a thick deciduous neck, purplish in lower half, 6—9 cm. above the ground, 8—9 mm. in diam. *Scape* central, flattish on one side, rounded on the other in lower half, subterete above, to 30 cm. or more tall in nature (to more than 90 cm. tall with optimum culture at La Jolla, Calif.), 5.75—6 mm. in diam. at the base, 3 mm. in diam. at the apex. *Spathe* monophyllous, closed at first, greenish-whitish with 9—10 dingy brownish-greenish vertical veins, changing to purplish, 2.6 cm. long, lanceolate, acute, soon bursting irregularly from the pressure of the expanding pedicels and flower buds. *Umbel* centripetal, 52—58- or more-flowered, (with sometimes a sub-umbel, 4—6-flowered, produced outside at the pedicel apex and setepal base of a flower, with smaller flowers having relatively shorter pedicels); normal flowers relatively large, broadly campanulate, light lavender in bud, opening whitish, with lavender mid-vein in each tepal. Flowers with an alliaceous scent. *Pedicels* green, stout, 3—3.5 cm. long, 2 mm. in diam., somewhat discoidally swollen at the apex. *Perigone:* tepals oblong, setepals 9 mm. long, 5 mm. wide, acute; petepals 9 mm. long, 4 mm. wide acute. *Stamens:* filaments purplish in upper ¾, 4.5 mm. long, filiform above, dilated below, united into a staminal cup at the base, with nectariferous tissue at the base between the 3 setepals and the base of the stamens; anthers purplish, oblong, 2.25 mm. long, shrinking to 1 mm. long at anthesis. *Ovary* 2 mm. high, 3 mm. in diam., ovules 2 per cell; 6-crested, 3 nectary pores appear on sides of ovary; style purplish, at first very short, elongating to 3.5 mm. after anthesis, then whitish; stigma undivided, minute. *Capsule* trigonous, 5 mm. high, 8 mm. in diam.; very obscurely 6-crested; seeds globose-angled, 2.5 mm. in diam.

Range.—South of Huehuetenango, Guatemala; low hillsides in grass between trees, growing singly, widely scattered.

Notes.—A very distinct species, which apparently increases by seeds only. It resembles *A. glandulosum* and *A. longifolium* in the leaves sheathing below to form a relatively long deciduous neck, but otherwise is quite distinct—apexes of pedicels discoidally swollen, flowers broadly campanulate with an alliaceous scent, and other differences.

One male-sterile seedling (lacking viable pollen) has been observed. The plant is vigorous, but the pedicels of the umbel are rather shorter than in the self-fertile seedlings.

2. **Allium scaposum** Benth. in Pl. Hartweg. 26. 1840; Plant Life 24: 40. 1968.

Holonomenifer: Hartweg no. 234, from Aguascalientes, Mexico, annotated in Bentham's handwriting, in Roy. Bot. Gard. Kew, Herbarium (K). Isonomenifer: Hartweg, in Dept. of Botany, British Museum, Herbarium (BM). See Figs. 28 and 29 for photo-copies.

Bulb ovoid. *Leaves* radical, linear-terete. long-sheathing below, shorter than the scape. *Scape* terete, slender, 30 cm. long or longer. *Spathe* bifid, broad, shorter than the pedicels. *Umbel* many-flowered; loose in fruit. *Pedicels* 2.5 cm. long. *Perigone:* tepals 6 cm. long, lanceolate, acuminate, rather acute, white when dry, red-keeled. *Stamens* subequaling the tepals, filaments subulate, dilated at the base.

Range.—Mexico: Aguascalientes, along small streams.

Notes.—The nomenifer description is reproduced here to aid in matching-up the details with plants collected in the wild.

3. **Allium kunthii** G. Don, Mem. Wern. Soc. 6: 82. 1827; Plant Life 23: 59-60. 1967; Ownbey, Res. Stud. State Coll. Wash. 18: 221-222. 1950 (1951), in part; Traub, Plant Life 23: 94-95. 1967, in part.

Syn.- *Schoenoprasum lineare* H. B. K., Nov. Gen. et Sp. Pl. 1: 277. 1816.

Holonomenifer: Humboldt & Bonpland [nr. 4286], Herbarium, Mus. Nat. Hist. Phaner., Paris (P). See Fig. 27 for photo-copy.

Bulb ovate, the size of a cherry, with numerous fibrous roots at the base. *Leaves* narrowly linear, flat, striate, glabrous, very thinly membranous at the base, sheathing to 10 cm.; shorter than the striate, terete scape. *Scape* erect, terete, striate, glabrous, 13—15 cm. long. *Spathe* ovate-lanceolate, withered, striate, glabrous, 7—9 mm. long, reflexed. Umbel 12—15-flowered; flowers whitish, tepals with a red mid-vein. *Pedicels* terete, glabrous, 1.4—1.8 cm. long. *Perigone:* tepals oblong, rather acute, spreading. *Stamens* as long as the tepals, filaments glabrous, subterete, anthers oblong, pollen gray. *Ovary* ovate, trigonous; style subequaling the stamens.

Range.—Mexico: between Santa Cruz de la Sierra and Mont El Gigante, alt. 2,346 m. Blooms in September.

Notes.—The epithet *"lineare"* applied to this species by Kunth translates as "the long slender" or "linear". The name apparently refers to the long narrowly linear leaves. The species was formerly considered as similar to *Allium scaposum* Benth., and *A. longifolium* (H.B.K.)Spreng., which are quite different, larger species.

Up to the present it has not been matched up with living plants collected by Dr. Howard. However, he expects to search for it in the nomenifer locality in 1968.

4. **Allium huntiae** Traub, **sp. nov.**

Holonomenifer: Howard 67-19B = Traub 1077 (TRA), July 22, 1967, west of Durango, Dur., Mexico; Mexican Highway 40, K. 1016.

Bulb ovoid, 1.5 cm. long, 1.2 cm. in diam.; outer coats dark brown, inner white, membranous, with sparse vertical fibers; not rhizomatous. Leaves 2, shorter leaf sometimes very short, 0.6—3.7—14.7 cm. long, about 2 mm. wide, apparently spirally twisted, channeled, acute, sheathing below to form a deciduous neck, 4.4—4.7—6 cm. long, 4 mm. in diam. *Scape* slender, 23—24—28 cm. long. *Spathe* 1.2—1.6 cm. long, membranous. *Umbel* lax, 11—13—18-flowered; flowers relatively small, campanulate, pink, keeled deeper pink. *Pedicels* slender, unequal in length, 1.5—1.8—2—

2.2 cm. long at anthesis. *Perigone:* tepals 7 mm. long 1.5 mm. wide. *Stamens* about 2 mm. shorter than the tepals; filaments 4 mm. long; anthers 1 mm. long at anthesis. *Ovary* globose, 1.75 mm. long, 1.5 mm. in diam.; appears to be slightly 6-crested; style 3 mm. long.

RANGE.—Collected by Dr. T. M. Howard (67-19B), west of Durango, Dur., Mexico; Mexican Highway 40, K. 1016; wooded hills, July 22, 1967.

NOTES.—*Allium huntiae* differs from *A. kunthii* in the spirally twisted leaves, the longer spathe, pedicels unequal in length, the pink campanulate flowers, and other particulars.

Named in honor of Miss Dora G. Hunt who ably assisted the late Dr. L. K. Mann with his researches in the genus *Allium.*

5. **Allium pueblanum** Traub, **sp. nov.**

Bulba ovoidea; foliis 2—3 anguste linearibus, infra vaginatis colla decidua formatis; scapo angustissimo; umbella 5-flora; floribus campanulatis albis; costis mediis tepalorum rubellis; pedicellis 1—1.4 cm. longis; tepalibus 6 mm. longis; staminibus quam tepalibus brevioribus; stylo in anthesin quam staminibus breviori; stigmate integro.

HOLONOMENIFER: Smith, Peterson & Narcisso Tejeda no. 3889 (=US 2397905), July 17, 1961, above Coxcatlan, between Apala and the top of Cerro Chichiltepec.

BULB 1.5—1.8 cm. long, 1.1—1.5 cm. in diam., ovoid, outer coats membranous, dark brown; roots fine. *Leaves* 2—3, narrowly linear, 17—19—24 cm. long, 1—2 mm. wide, sheathing below to form a deciduous neck, 3.5—5.5 cm. long, 3 mm. in diam., about half below the soil surface. *Scape* very slender, 9.5—11.5 cm. long, 1—1.5 mm. in diam. *Spathe* lanceolate, 1.7 cm. long, with sparse vertical veins. *Umbel* 5-flowered flowers campanulate, white, tepals with pink midveins. *Pedicels* very slender, 1—1.2—1.4 cm. long. *Perigone:* tepals 6 mm. long, 1 mm. wide. *Stamens* slightly shorter than the tepals 3 mm. long, anthers less than 1 mm. long at anthesis. *Ovary:* style shorter than the stamens at anthesis, stigma undivided.

RANGE.—State of Puebla, Mexico, above Coxcatlan between Apala and the top of Cerro Chichiltepec; igneous and sedementary rock outcrops with dark soils, primarily oak-pine forest; alt. ca. 2000—2500 m. Flowering in July and August.

NOTES.—From the evidence at hand, it appears that this species increases only by means of seeds. *Allium pueblanum* differs from *A. telaponense* mainly in having usually more than 2 leaves, a shorter scape a 5-flowered umbel, longer spathe and pedicels.

6. **Allium telaponense** Traub, **sp. nov.**

Bulba parva globosa; foliis 2 anguste linearibus, infra vaginatis colla decidua formatis; scapo angustissimo; spatha 7—8 mm. longa; umbella 2—3-flora; floribus campanulatis; tepalibus albidis, costis mediis subpurpureis; pedicellis 6—10 mm. longis; staminibus quam tepalibus dimidio brevioribus; stylo 4 mm. longo.

HOLONOMENIFER: John H. Beaman no. 2430 (=US 2366057), Sept. 4, 1958; State of Mexico, Telapon, north of Iztaccihuatl, south side of mountain.

Bulb small, globose, 1.2 cm. long, 1 cm. in diam., outer bulb coats brownish, membranous, roots fine. *Leaves* 2, narrow linear, shorter leaf 3—5.5 cm. long, longer leaf, 13—15 cm. long, 1 mm. wide, bluntly acute, sheathing below to form a deciduous neck, 6.5—7.5 cm. long, about half underground, above ground half purplish. *Scape* very slender, 18—22 cm. long. *Spathe* membranous, 7—8 mm. long. *Umbel* 2—3-flowered; flowers campanulate, tepals whitish, with purplish midveins. *Pedicels* very slender 6—10 mm. long. *Perigone:* tepals oblong, 7 mm. long, 2 mm. wide, apex bluntly acute or roundish. *Stamens* about half the length of the tepals; filaments 4 mm. long, filiform; anthers 1.5 mm. long before anthesis. *Ovary* globose, 2 mm. long, 2 mm. in diam.; style 4 mm. long, capitate.

RANGE.—State of Mexico; Telapon, north of Iztaccihuatl, south side of mountain, alt. 3450—3650 m., in grassy meadow, under open *Pinus hartwegii* forest; frequent. Flowering in late September—October.

NOTES.—From the evidence available, it appears that this species increases only by means of seeds. The two narrow-linear leaves, 2—3-flowered umbel, flowers small, pedicels very short, characterize this species.

7. **Allium mexicanum** Traub, **sp. nov.,** in Plant Life 23: 89, 90. 1967, **anglise.**

Bulba elongato-oblonga, tunicis membranaceis, verticaliter fissa; radicibus subcrassiusculis usque ad 3 mm. diametro; foliis 3—4 breviusculis; scapo 21—23 cm. longo; umbella 8—12-flora; floribus campanulatis lilacinis, costis mediis atropurpureis; staminibus styloque quam tepalibus brevioribus.

HOLONOMENIFER: Stanford, Lauder & Taylor no. 2629 (=US 2219025), July 22, 1949, Tamaulipas, Mexico, between Marcella and Hermosa.

Bulb seated 3 cm. below soil surface, long-oblong, 3.5—3.8 cm. long, 1.1—1.5 cm. in diam.; bulb coats white, membranous, with sparse vertical veins, splitting vertically; roots *rather coarse,* to 3 mm. in diam. *Leaves* up to 4, upright, rather short, 10—14—15 cm. long, up to 3 mm. wide, bluntly acute to acute-rounded. *Scape* 21—23 cm. long. *Spathe* monophyllous, whitish, transparent, splitting to one side. *Umbel* 8—12-flowered; flowers campanulate, tepals lavender, with deep purple or blackish midveins. *Perigone:* tepals 8 mm. long, 2.5 mm. wide, oblong acute, withering, connivent in fruit. *Stamens* slightly shorter than the tepals; filaments 6 mm. long, anthers oblong, 2 mm. long, 2-lobed at the base. *Ovary* 2 mm. long, 2.5 mm. in diam.; style 3 mm. long, stigma undivided. *Capsule* 5 mm. high, 4 mm. in diam.; seeds 1 per locule, 4 mm. long, 2 mm. in diam., black.

RANGE.—Tamaulipas, Mexico, between Marcella and Hermosa, in burned over area.

NOTES.—*Allium mexicanum* is the only species in Subsection *Mexicana* with coarse roots. This feature, together with long-oblong bulbs, campanulate flowers having lavender tepals with deeper purplish midveins, and other characters, set it apart from the other species in the subsection that increase vegetatively by bulb-splitting vertically. Pedicels 1—2.2 cm. long.

8. **Allium howardii** Traub, in Plant Life 23: 90—91. 1967.

DESCRIPTION.—See Plant Life 23: 90—91. 1967.

RANGE.—Southeastern Edwards County, Texas.

NOTES.—This is a smaller plant than *A. mannii,* and differs from the latter in various particulars.

9. **Allium mannii** Traub & T. M. Howard.

Bulb oblong, 1.5 cm. long, 1 cm. in diam., coats membranous; increasing by vertical splitting of the bulbs; *leaves* 2—3, 20—35 cm. long, 3 mm. wide, canaliculate. *Scape* up to 55 cm. long; *spathe* 1.5 cm. long; *umbel* (15—) 25-flowered; *perigone:* tepals 10 mm. long, 1.5—2 mm. wide, white to pale pink, keeled green to purplish.

RANGE.—Collected by Dr. T. M. Howard (67—14), State of Durango, Mex. east of Durango City, on Mexican Highway 40; roadside, in low wet pastures and ditches, in heavy clay soil of volcanic origin, often growing in standing water after rains Alt. 1,829 m.

Named in honor of the late Dr. L. K. Mann, of the University of California, Davis, who made outstanding contributions toward the advancement of knowledge about the Alliums.

10. **Allium traubii** T. M. Howard, in Plant Life 23: 62; 91. 1967.

DESCRIPTION.—See Plant Life 23: 91. 1967.

RANGE.—State of Nuevo Leon, Mexico, near the Chihuahua State line.

NOTES.—This species differs from *Allium howardii* in the medium green, canaliculate leaves, 3-ridged on under side, 2 mm. wide, and in the few-flowered umbel, light lavender flowers, and other particulars.

Since the last report a free-flowering form with the umbel many-flowered, flowering in summer and autumn, is recognized here.

10a. **Allium traubii** forma **traubii.** The nomenifer form.

10b. **Allium traubii** forma **liberflorens** T. M. Howard, **f. nov.**

A typo in plerumque in culto sempervirens multiflorum et estive autumnaleque florens differt. Holonomenifer: #1078(TRA), 9-19-67. Umbel many-flowered, appearing in summer and autumn. Leaves 3 mm. wide.

11. **Allium ownbeyi** Traub, **sp. nov.**

Specimen: T. M. Howard s. n. = 1066 (TRA), Nov. 1966, Nuevo Leon, Cerro del Obispado, 30 mi. n. Monterrey, Mexico.

Bulb 2 cm. long, 1.2 cm. in diam.; outer coats membranous, dark brown, with sparse vertical fibers; bulbs splitting vertically into 2 bulbs. *Leaves* 5—6, broadly canaliculate, glabrous above, bluntly acute, 6—8 ridged on the back, denticulate on the ridges and on the leaf margins, to 18 cm. long, 4.5 mm. wide; sometimes slightly spirally twisted. *Scape* flattish, or angled, denticulate on the margins, 24—28 cm. long, 2mm. in diam. *Spathe* 1—1.2 cm. long, monophyllous, prominently vertically 5-nerved. *Umbel* 7—13-flowered; flowers light lavender, tepals spreading, with deeper mid-vein. *Pedicels* 1—1.3 cm. long, very slender. *Perigone:* tepals oblong-lanceolate, bluntly acute, 5—6 mm. long, 3 mm. wide. *Stamens:* filaments 6 mm. long, widening below and united into a short staminal cup; anthers less than 1 mm. long at anthesis. *Ovary* 3-lobed, 2 mm. long, 2 mm. in diam., 6-crested, style 4 mm. long; stigma undivided.

RANGE.—Mexico, State of Nuevo Leon, about 30 mi. north of Monterrey. Flowering in November.

NOTES.—This species is named for Dr. Marion Ownbey, the well-known worker on the North American Alliums. It differs from all of the other species in the subsection *Mexicana* in the wider, shallowly canaliculate sometimes somewhat spirally twisted leaves which are denticulate on the margins, and on the ridges on the back; the flattish to angled scape, denticulate on the ridges, the late flowering period, and in other particulars.

12. **Allium rhizomatum** Wooton & Standley, in Contr. U. S. Nat. Herb. 16: 114. 1913; Traub, in Plant Life 23: 92. 1967.

DESCRIPTION.—See Plant Life 23: 92. 1967.

NOTES.—This species differs from the other rhizome-bearing species in that the rhizomes are scaly.

13. **Allium elmendorfii** M. E. Jones ex Ownbey, in Res. Stud. State Coll. Wash. 18: 218—219. 1950; "Allium elmendorii" M. E. Jones, in Contrib. West. Bot. 18: 20. 1935, anglise; Traub, in Plant Life 23: 90. 1967.

DESCRIPTION.—See Plant Life 23: 90. 1967.

RANGE.—South Texas.

NOTES.—Distinguished from all others in the subsection *Mexicana* by the short-stalked bulblets borne at the base of the bulb.

14. **Allium michoacanum** Traub.

Bulb very small; 6 mm. long, 4 mm. in diam.; coats membranous; increasing by bulblets borne terminally on slender rhizomes. *Leaves* 2—3, very narrow, sheathing below to form a narrow deciduous neck, to 4 cm. long, 2 mm. in diam.

RANGE.—Collected by Dr. T. M. Howard (H 67-74A) on Mexican Highway 15. K. 233, east of Morelia, Michoacan, in mountains.

NOTES.—This is apparently among the smallest of the Mexican Alliums.

15. **Allium fantasmosense** Traub, **sp. nov.**

Bulba ovoidea, tunicis membranaceis, bulbellas terminales in rhizomis producta; foliis usque ad 5, usque ad 32 cm. longis et 4 cm. latis, infra usque ad 7 cm. vaginatis; scapo gracili 14—18 cm. longo; spatha lanceolata; umbella 9—11-flora; pedicellis angustissimis; tepalibus 5 mm. longis 2 mm. latis; staminibus 4 mm. longis; stylo 4 mm. longo.

HOLONOMENIFER: Traub 1076 (TRA), 10-12-67, grown at La Jolla, Calif., from stock collected by Dr. T. M. Howard, Aug. 5, 1967 (Howard 67-87A), San Luis Potosi, Valle de los Fantasmos, Mexican Highway 85.

Bulb ovoid, 1.5 cm. long, 1 cm. in diam.; coats membranous with sparse vertical fibers, forming bulbs at the end of slender rhizomes. *Leaves* 4—5, linear, canaliculate, up to 32 cm. long, 3—4 mm. wide, sheathing below to form a deciduous neck, 4—7 cm. long, 2.5—3 mm. in diam. *Scape* slender, somewhat angled in lower half, subterete above, 14—18—(24—28) cm. long, 3 mm. in diam at the base, narrowing gradually above to 1 mm. in diam. *Spathe* monophyllous, membranous, 1.3 cm. long *Umbel* 11—16-flowered, flowers light brownish-red (mahogany). *Pedicels* very slender, 1.2—1.9—2.6 cm. long, 0.25 mm. in diam. *Perigone:* tepals spreading, lanceolate, 5.5 mm. long, 2 mm. wide, acute. *Stamens* as long as or slightly longer than the tepals; filaments filiform, 5.5 mm. long, widening below and united into a short staminal cup; anthers 0.5 mm. long at anthesis; pollen ash gray. *Ovary* 2.5 mm. long, 2 mm. in diam., very obscurely 6-crested, with nectary glands on the 3 sides of the ovary opposite the three petepals; style 2.5 mm. long after anthesis, stigma undivided.

RANGE.—Collected by Dr. T. M. Howard (67-87A), in the Valle de los Fantasmos San Luis Potosi, Mexico, Mexican Highway 85, alt. 2,896 m. Flowers in August-September.

NOTES.—Named for its native habitat, the Valle de los Fantasmos. This species can be easily distinguished from *Allium glandulosum*, a much taller plant, by the narrow, canaliculate leaves, the somewhat angled to subterete scape, fewer-flowered umbel, the very slender pedicels, smaller flowers, and other features.

16. **Allium** sp. (Howard 67-87B).

Differs from the preceding species in having flat leaves, and in other particulars.

RANGE.—Mexico: San Lusi Potosi, Valle de los Fantasmos.

17. **Allium durangoense** Traub, **sp. nov.**

Bulba parva, tunicis membranaceis; foliis 3—5 angustis spiraliter contortis infra vaginatis; scapo centrali terete; spatha lanceolata; umbella centripetali 9—23-flora; floribus campanulatis usque ad substellatis albis, costa media rubella; pedicellis 1.8—2.5 cm. longis; staminibus styloque quam tepalibus brevioribus; ovario 6-cristato; capsula obscure cristata; seminibus pro ratione parvis nigris.

HOLONOMENIFER: No. 1069 (TRA), grown at La Jolla, Calif. 7-14-67, from bulbs collected by Dr. T. M. Howard, (65-4), east of the City of Durango, Dur., Mex., July 11, 1965. Paranomenifer specimens: Traub Nos. 1070, 1072 and 1073 (TRA)

Plant slender, delicate, *bulb* globose to ovoid, 1.2—1.5 cm. long. 1—1.2 cm. in diam.; bulb coats white with sparse vertical fibers, producing flowering-sized bulbs on lateral rhizomes, up to 13 cm. long, 3 mm. in diam., the old bulbs persisting. *Leaves* 3—4—5, upright, narrow, canaliculate, rounded on the under side, spirally twisted, (4—12)—16—21—28 cm. long, 2—2.5 mm. wide, light green, acute, sheathing below to form a narrow deciduous neck, 7—7.5—8 cm. long, 2.5—3 mm. in diam., brownish in lower ⅓ to ½. *Scape* central, terete, very slender, 21—26—28 cm. long, from top of deciduous neck, 2—2.25—2.75 mm. in diam, green, ultimately overtopping the longest leaves. *Spathe* monophyllous, lanceolate, closed at first, whitish, translucent, with 4—5 vertical nerves, 1.7 cm. long, soon rupturing at one side by the pressure of the expanding pedicels and pedicels, finally disposed to one side. *Umbel* centripetal, loose, flattish on top, 9—21—23-flowered; perigone very broadly campanulate to almost stellate; tepals whitish, keeled reddish-brown; ovary pinkish, with slight alliaceous scent. *Pedicels* slender, 1.8—2—2.5 cm. long, mostly curved outward and upward, green, 1 mm. in diam. *Perigone:* tepals elliptic acute; setepals 8 mm. long, 3.5 mm. wide; petepals 8 mm. long, 3 mm. wide. *Stamens:* filaments 5 mm. long, white, filiform, slightly dilated at the base, and united into a short staminal cup; anthers introrse, purplish, 1 mm. long before anthesis, shrinking to 0.5 mm. long after anthesis, pollen dark grayish. *Ovary* pink, 3-lobed, 6-crested on top; style white, filiform, very short at first, elongating to 4 mm. after anthesis; stigma very minutely capitate. *Capsule* trigonous, 4 mm. high, 5 mm. in diam.; seeds relatively small, roundish on one side, angled on two sides, pointed at one end, 1.75 mm. long, 1.75 mm. in diam., dull black.

RANGE.—East of the City of Durango, Dur., Mexico, in the plateau, grassy pastures, Mexican Highway 40, K 855 and 870. Collected by Dr. T. M. Howard in 1965 and 1967.

NOTES.—*Allium durangoense* is a very distinct species; the plant is slender, delicate, with spirally twisted leaves; the scape ultimately overtopping the longest leaves, the flower is whitish with a contrasting pinkish ovary. In dried specimens the leaves are usually very much shrunken so that it is difficult to distinguish the spirally twisted leaves except by magnification.

18. **Allium subteretefolium** Traub.

Bulb ovoid, bearing bulblets terminally on long rhizomes. *Leaves* 3—4, very slightly channeled on top, rounded below, giving the appearance of being terete, 41—55 cm. long, 3.5 mm. in diam., light green, glabrous, sheathing below to 5 cm. to form a deciduous neck.

RANGE.—Collected by Dr. T. M. Howard (H 66-3A), San Luis Potosi, Mexico.

NOTES.—This species differs from all others in the subsection *Mexicana* in the very long subterete leaves.

SECTION **RHOPHETOPRASON** TRAUB

Section **Rhophetoprason** Traub, **Sect. nov.** genus **Allium** L. (Amaryllidac.); in Plant Life 23: 110. 1967, **anglise.**

Tunicae bulborum membranaceae, fibris sparsis verticalibus; plantae per semines et bulbas florentimodas in rhizomis lateralibus reproductae, bulbis vetustis non persistentibus; foliis 4—5 vel pluribus infra prominente vaginatis. Typus: **Allium glandulosum** Link & Otto

19. **Allium glandulosum** Link & Otto, Ic. Pl. Rar. Hort. Berol. 1: 33, pl. 17. 1841; Ownbey, Res. Stud. State Coll. Wash. 15: 224-225. 1947; ibid. 18: 219-220. 1950; Traub, Plant Life 23: 92-94. 1967.

Syn.—"Allium longifolium Lindl." (misapplied name), in Bot. Reg. 12: pl. 1031. 1826-27, non (H.B.K.) Spreng. 1825.

DESCRIPTION.—See Plant Life 23: 92-94. 1967.

RANGE.—Plants have been collected in the State of Hidalgo, Mexico; and in southern Honduras. In 1966, Dr. Howard collected a form of this species in the State of San Luis Potosi.

NOTES.—*Allium glandulosum* is related to *A. longifolium* in the method of vegetative reproduction (see Fig. 26), but differs from it in the relatively less thicker, and shorter leaves, the flattish, striated scape, and the usually many-flowered umbel of brownish-red (mahogany) sweet (honey) scented flowers, the copious nectar produced; the crestless ovary, and other particulars.

Under optimum culture, *A. glandulosum* may produce from 4 to 5 side sprouts, besides the main shoot, from 2—3 of the side sprouts may produce flower scapes. This is in addition to the 2—3 flower scapes produced from the main shoot. In nature, this apparently does not happen, but it may be that two central scapes may be produced from the main shoot. If plants approximating those in nature are desired under culture, it is advisable to apply fertilizer sparingly.

It is desirable to store the dormant bulbs in dry sand or sandy soil, and to plant them from mid-May to mid-June in a sandy, well-drained soil.

20. **Allium longifolium** (H.B.K.) Spreng. **emend.**
Spreng., in Syst. Veg. 2: 38. 1825.

Syn.- *Schoenoprasum longifolium* H.B.K., Nov. Gen. et Sp. Pl. 1: 277. 1816; Plant Life 23: 60. 1967.

LECTONOMENIFER: Humboldt & Bonpland, without number, Herb. Mus. Nat. Hist. Phaner. Paris (P), near Queretaro, Aroyozarco and San Juan del Rio, Mex. alt. 1,856 m. flowering in Aug. (see Fig. 27 for photocopy).

Recent verifying specimens: T. M. Howard 67-35 (TRA 1073), 1 mi. w. Magdalena, Jalisco, Mex. July 26, 1967; and Traub 1075(TRA), grown at La Jolla, Calif. Sept. 10, 1967, from bulbs collected by Dr. T. M. Howard, near Tuxpan, Michoacan, July 1, 1964 (Howard 64-57A).

Bulb ovoid, 2.5 cm. long, 1.5 cm. in diam.; bulb coats white, membranous, with sparse vertical fibers; producing 2 or more flowering-sized bulbs on lateral rhizomes, the old bulb not persisting. *Leaves* 3—4—5, very long, thick, 32—41—52 cm. long (to 49—64 cm. long under optimum culture), 3—4.5 mm. wide, deeply channeled, rounded on the back, vascular bundles in one row, gradually narrowing to the acute apex, sheathing below to form a long deciduous neck, 4—4.5 cm. long (7—25 cm. long under optimum culture), 8—10 mm. in diam. *Scape* central, terete, 40—47 cm. long (to 55 cm. long under optimum culture), 4 mm. in diam. where it emerges from the deciduous neck, gradually narrowing to 1.5 mm. in diam. at the apex. (Under optimum culture 1 or 2 side shoots with scapes somewhat smaller may be produced.) *Spathe* lanceolate, membranous, 1.5 cm. long, 5 mm. in diam., vertically 4-nerved. *Umbel* 6—12-flowered under optimum culture 8—16—28-flowered; perigone very pale lavender, almost white, tepals with lavender midribs, spreading to very broadly campanulate; stamens, filaments pale lavender, pollen light lavender, style light lavender; flowers with slight alliaceous scent. *Pedicels* slender, 1.5—1.7—2.5—3 cm. long (under optimum culture, 1.5—2—2.3—3.3 cm. long). *Perigone:* tepals oblong, acute, 9 mm. long, setepals 4 mm. wide, petepals 3 mm. wide. *Stamens:* slightly shorter than the style, filaments 7 mm. long, dilated below, and united into a short staminal cup; anthers 2 mm. long, shrinking to 1 mm. long at anthesis; pollen light lavender. *Ovary* 2 mm. long, 2 mm. in diam., obscurely 6-crested; style 5 mm. long, shorter than the tepals; stigma undivided; nectaries on the sides of the ovary opposite the 3 petepals, but nectar is sparse as compared with that in *A. glandulosum*. *Capsule* trigonous, 4 mm. long, 5 mm. in diam.

RANGE.—Living material collected by Dr. T. M. Howard in red clay soil, cornfield, by roadside, between Zitacuaro and Ciudad Hidalgo, near Tuxpan, Michoacan, Mexican Highway 15, July 2, 1957 and July 1, 1964 (Howard 57-11B And Howard 64-57A); and 1 mi. west of Magdalena, Jalisco, Mexican Highway 15, in heavy clay soil, July 25, 1967 (Howard 67-35).

NOTES.—*Allium longifolium* is related to *A. glandulosum* in the method of vegetative reproduction, but differs from it in the very long leaves, the terete scape, the fewer flowers in the umbel, in the production of less nectar, the obscurely 6-crested ovary, the slight alliaceous scent of the flowers, and in other particulars.

One male-sterile seedling was observed under cultivation; the plant has shorter leaves, the umbel is 8-flowered; the flowers are purplish, with deeper tepal midribs, and do not open widely. "

From the original description of *Allium longifolium* it appears that the species was collected near *Queretaro, Aroyozarco* and *Juan del Rio*. It is argued that there must have been at least two specimens. For no apparent valid reason, some American workers have *erroneously* referred the one known specimen (Fig. 27) to *Nothoscordum bivalve,* and would leave matters in this confused state for another century and a half in spite of the fact that the known specimen (Fig. 27) matches up with plants collected in the wild by Dr. Howard. Since H.B.K. did not indicate a holonomenifer, the known specimen is designated the lectonomenifer.

ORIENTATION OF VASCULAR BUNDLES IN **ALLIUM** LEAVES

Hamilton P. Traub

For some time it has been recognized that data on the orientation of vascular bundles in the leaves might be of diagnostic value in the grouping of *Allium* species (Feinbrun, 1954; Mann, unpublished notes). To encourage research in this field, methods of preparing material are suggested. Brief summaries of observations on vascular bundles of foliage leaves (Mann, unpubl. notes) and on chromosome numbers (Cave, et al. 1956-1964; Ornduff, 1967; Tutin, 1957) are given. In the tabulation, species are grouped as proposed by Traub (1968).

MATERIALS AND METHODS

Permanent Slides.[1] The best means to demonstrate the arrangement of vascular bundles requires glass slide preparations from material fixed, embedded, and then cut on the microtome. For this purpose Mann fixed leaf pieces in Craf III (Sass, 1951). Soft material was embedded in water soluble carbowax (polyethylene glycol) (Riopel and Spurr, 1962) and hard material in tissuemat by the well-known tertiary butyl alcohol method (Johansen, 1940). For both procedures sections were stained in hematoxylin. Carbowax-embedded material to be photographed was mounted temporarily in water. This gave beautiful preparations free of distortion, plasmolysis, and cell wall shrinkage. These slides were made semi-permanent by drawing off the water, mounting the sections in glycerine jelly (Johansen) and ringing the cover glasses with an air-tight cement such as Duco.[2] Sections mounted in this manner suffer some distortion and are not suitable for photographs but can be used for microscope study and for making camera lucida drawings.

Herbarium Sections. To survey bundle orientation in a large number of species, a simpler, more rapid technique is required. Dried leaf sections serve this purpose, and the preparations can be permanently attached to the appropriate herbarium sheets. This technique is not a replacement for glass slides but is a useful method for preliminary observation.

Very thin cross-sections of leaves are cut free hand with a sharp knife or razor blade. A rectangle about 6 cm. x 8 cm. of moisture permeable cellulose acetate film (DuPont brand, thickness 200-ca-43) (Traub, 1950, 1951) is wetted on one side with water, the sections arranged in order, and a second rectangle of cellulose acetate film placed over the sections so they are tightly held in place. The preparation is placed between pieces of blotting paper about 8 cm. x 10 cm., labelled, and pressed. A discarded book suitably weighted works well. When the sections

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[1] The procedure for making permanent slides has been contributed by Miss Dora G. Hunt, Department of Vegetable Crops, University of California, Davis.

[2] E. I. du Pont de Nemours & Co., Wilmington, Delaware.

Table. **Allium** L. species: observations on vascular bundles in foliage leaves and chromosome numbers. Grouping according to Traub (1968).

Abbrev.—**canal.** = canaliculate; **flattd.** = flattened; **sl.** = slightly

Lineagic category	Basic chromosome number (x)	Vascular bundles number rows orientation	Foliage leaf blade shape of X-section
Subgenus I. **AMERALLIUM** ($x=7$ except a few $x_2=8$, $x_3=9$)			
Sect. I. **CAULORHIZIDEUM**			
A. brevistylum S. Wats.	2n=14	1	broadly canal.
A. gooddingii Ownb.	2n=14	1	broadly canal.
A. validum S. Wats.	2n=—, 28, 56	1	broadly canal.
Sect. II. **AMERALLIUM**			
Subsect. I. **MEXICANA**			
A. scaposum Benth.	2n=?	1; 2 bundles at mid-vein	half terete
Subsect. II. **CANADENSIA**			
A. macropetalum Rydb.	2n=14	1 (circle)	terete
A. canadense L.	2n=14, 28	1	shallowly canal.
A. drummondii Regel.	2n=14, 28	1	shallowly canal.
A. plummerae S. Wats.	2n=14, 28	1; 2 bundles at mid-vein	shallowly canal.
A. textile Nel. & Macbr.	2n=14, 28	1	shallowly canal.
A. geyeri S. Wats.	2n=14, 28, 42	1	shallowly canal.
Sect. III. **LOPHIOPRASON**			
Subsect. I. **CERNUA**			
A. sp. (near **obtusum**)	2n=?	1	furrowed
A. stellatum Fras. ex Ker-Gawl	2n=14	1	furrowed
A. haematochiton S. Wats.	2n=14	1	furrowed
A. californicum Rose	2n=14	1; 2 bundles at mid-vein	thick
Subsect. II. **FALCIFOLIA**			
A. douglasii Hook	2n=14	1	canal.
A. madidum S. Wats.	2n=14, 42	1	canal.
A. nevii S. Wats.	2n=14	1	canal.
A. tolmiei Bak.	2n=14	1	canal.
A. anceps Kell.	2n=14	1	flat
A. siskiyouense Ownb.	2n=14	1	flat
A. fibrillum Jones	2n=14	1	canal.
A. persimile (Ownb.) Traub	2n=—, 42	1	canal.
A. crenulatum Wieg.	2n=14	1; 2 bundles at mid-vein	canal.
A. platycaule S. Wats.	2n=14	1 irregular (or 2?)	flat
Subsect. III. **SANBORNIANA**			
A. fimbriatum S. Wats.	2n=14	2-3 (circle)	terete, solid
Subsect. IV. **ACUMINATA**			
A. amplectans Torr.	2n=14, 21	1	furrowed
A. hyalinum Curr. ex S. Wats.	2n=14	1	half terete
Subsect. V. **CAMPANULATA**			
A. campanulatum S. Wats.	2n=14, 28	1	canal.
A. bisceptrum S. Wats.	2n=14	1	canal.
Subsect. VI. **BOLANDERIANA**			
A. bolanderi S. Wats.	2n=14	1	half terete
Sect. IV. **RHOPHETOPRASON**			
A. glandulosum Link & Otto	2n=—, 28	1	thick, sl. canal.
Sect. V. **MOLIUM**			
A. neapolitanum L.	2n=14	1	flat, sl. keeled
A. subhirsutum L.	2n=14	1	flat, curved
A. roseum L.	2n=16, 32	1	flat, curved
A. zebdanense Boiss. et Noe	2n=18	1	flat, v. thick mid-vein
Sect. VI. **XANTHOPRASON**			
None studied			
Sect. VII. **CHAMAEPRASON**			
A. chamaemoly L.	2n=?	1	flat
Sect. VIII. **OPHIOSCORODON**			
Subsect. I. **URSINA**			
A. ursinum L.	2n=14	1	keeled, nearly triangular

Subsect. II. **TRIQUETRA**			
A. triquetrum L.	2n=18	1;3 bundles at keel	triangular
Subgenus II. **NECTAROSCORDUM** $x_2=8$			
Sect. IX. **NECTAROSCORDUM**			
A. bulgaricum (Janka) Prodan	2n=?	1	flat
Subgenus III. **ALLIUM** ($x_2=8$, except a few $x=7$?, $x_3=9$, $x_4=10$)			
Sect. X. **RHIZIRIDEUM**			
A. tuberosum Rott. ex Spreng.	2n=16, 32	2, opposed	flat, thick
Sect. XI. **MELANOCROMMYUM**			
A. aflatuense B. Fed.	2n=16	2, opposed	flat, sl. curv.
A. nigrum L.	2n=16	2, opposed	flat, sl. curv.
Sect. XII. **CODONOPRASON**			
A. oleraceum L.	2n=—, 32, 40	2, opposed	flat. sl. curv., thick 7 canal.
Sect. XIII. **PETROPRASON**			
A. polyphyllum Kar. et Kir.	2n=—, 32	2, opposed	flat
Sect. XIV. **ALLIUM**			
A. ampeloprasum L.	2n=16, 32	2, opposed	flat, keeled
A. sativum L.	2n=16, 48	2, opposed	flat, keeled
Sect. XV. **HAEMOPRASON**			
None studied			
Sect. XVI. **MICROSCORDUM**			
None studied			
Sect. XVII. **ANGUINUM**			
A. tricoccum Ait.	2n=—, 32	2, opposed	furrowed
Sect. XVIII. **CEPA**			
Subsect. I. **FISTULOSA**			
A. fistulosum L.	2n=16	1 (circle)	fistulose, circ.
Subsect. II. **SCHOENOPRASA**			
A. schoenoprasum L.	2n=16, 32	1 (circle)	fistulose. sl. angled
Subsect. III. **POPOVIANA**			
A. chinense G. Don	2n=—, 24,32	1 (circle)	fistulose, 3-5-angled
Subsect. IV. **CEPA**			
A. galanthum Kar. et Kir.	2n=16	1 irreg. (or 2?) (circle)	fistulose, flattd.
A. cepa L.	2n=16, 32	1 irreg. (or 2?) (circle)	fistulose; often flattd. on one side

are dry, the edges of the film are stapled together and the preparation attached to the herbarium sheet. Some sections can be examined satisfactorily without magnification.

OBSERVATIONS

In the grouping of *Allium* species in the accompanying table, there appears to be a significant relation between vascular bundle orientation and basic (x) chromosome number. With 2 exceptions the species under subgenus *Amerallium* have the basic $x=7$ chromosome number, and with few exceptions, the foliage leaves in transverse section have essentially one row of vascular bundles normally oriented, i. e., phloem on the lower, xylem on the upper side of the leaf. Species having one row plus 2 or 3 bundles at the mid-vein are probably variations of the single row form.

The subgenus *Nectaroscordum*, with the basic $x=8$ chromosome number, is separated from the other two subgenera by the discoidally swollen pedicel apex, and the floral tepals 3—7-nerved. In the one species studied, the leaf vascular bundles are oriented in one row as in the subgenus *Amerallium.*

Species in subgenus *Allium* so far as reported here are uniform in having the basic $x_2=8$ chromosome number and in having leaf vascular bundles arranged in either 2 opposing rows or a circle.

Further understanding of relationships among the species of *Allium* awaits additional studies from many approaches such as the anatomical, morphological, genetical, and chemical.

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Postscript.—On further consideration, in the above article, and the one following (Traub, 1968), it appears that the Sections **Xanthoprason** and **Chamaeprason** should be reduced to subsections under Section V. Molium (see pages 144 and 161) since the differences are not sufficient for maintaining them on the sectional level:

Section V. **Molium** Endl. (1836)

Subsection I. **Neapolitana** (nomenifer: **A. neapolitanum** L.)

Subsection II. **Moliana** (nomenifer: **A. moly** L.)
Syn.-Section **Xanthoprason** F. Hermann

Subsection III. **Chamaemoliana** (nomenifer: **A. chamaemoly** L.) Syn.-Section **Chamaeprason** F. Hermann

THE SUBGENERA, SECTIONS AND SUBSECTIONS OF **ALLIUM** L.

HAMILTON P. TRAUB

I. INTRODUCTION

The genus *Allium* L. is among the more difficult groups in the *Amaryllidaceae.* It comprises a great, wide-ranging phylon in the North Temperate Zone; one very hardy species, *Allium schoenoprasum,* ranges even into the arctic. More than 600 species are recognized. The subtle differences in living plants are lost more or less in dried specimens. They are at once much *alike* to the uninitiated and yet quite distinct to the student who knows them as *living* plants.

The ideal procedure in the study of such plants is to preserve dried specimens and at the same time collect living material for more detailed study in the greenhouse or experimental garden. An adequate sample of living plants in each case should also be turned over to the caryologist for determining the chromosome complement. A dried specimen with the chromosome data added should then be deposited in the amaryllid herbarium maintained by such an organization as the American Plant Life Society where it can serve as a permanent reference source.

ALLIUMS AS A WHOLE, 1753-1875

Linnaeus (1753) recognized 31 *Allium* species. The Alliums were first placed under subgeneric groups by George Don (1827), who arranged 129 species under eleven divisions which were placed under seven sections as shown in Table 1.

Table 1. The sections of **Allium** according to G. Don (1827).

Porrum (Divs. I & II)
Schoenoprasum (Div. III)
Macrospatha (Divs. IV, V & VI)
Rhizirideum (Div. VII)
Molium (Divs. VIII & IX)
Anguinum (Div. X)
Ornithogalodeum (Div. XI)

Since 1827, additional sections have been proposed by other workers. Regel (1875) grouped 262 *Allium* species under six sections as shown in Table 2.

Table 2. The sections of **Allium** according to Regel (1875).

Porrum
Schoenoprasum
Rhizirideum
Macrospatha
Molium
Nectaroscordum

In the contributions of G. Don and Regel it is understandable that the North American *Allium* species were inadequately represented. Only a minor part of the North American species had been discovered, and the available herbarium material of the known species was meagre. After 1875, the study of the genus *Allium* was fragmented by being included only in various regional and local floras.

OLD WORLD ALLIUMS, 1876-1967

When Edmond Bossier published his ''Flora Orientalis'' (Bossier, 1882), including the area from Greece and Egypt to the boundaries of

India, he recognized a total of 141 *Allium* species for this region. J. D. Hooker published his "Flora of British India" in 1892, which included the treatment of the Alliums for this restricted area.

Victor Janka (1886) provided a key to the Alliums of Europe, and F. Hermann (1939) proposed sectional and subsectional names for the genus *Allium* in Europe, some of which are synonyms for groups proposed earlier.

Vvedensky (1935) grouped 228 *Allium* species of the U. S. S. R. under nine sections as shown in Table 3.

Table 3. The sections recognized for the Alliums of U. S. S. R., according to Vvedensky (1935). See also the English translation by Airy-Shaw, 1944 (1946).

1. Anguinum G. Don (1827)
2. Ophioscorodon (Wallr.) Endl. (1836)
3. Rhizirideum G. Don (1827)
4. Phyllodolon (Salisb.) Prokh. (1931)
5. Cepa (Moench) Prokh. (1931)
6. Haplostemon (Boiss.) Halaczy (1904)
7. Porrum G. Don (1827)
8. Caloscordum (Herb.) Bak. (1874)
9. Nectaroscordum (Lindl.) Gren. et Godr. (1855)

Thus matters stood, when Stearn (1936) published a bibliographical note on Don's 1827 "Monograph of the Genus *Allium.*" Interest in Alliums was further stimulated when, in 1944, Volume 11, of Herbertia (published in 1946) was devoted almost entirely to the genus. The Herbertia symposium included among other contributions, Airy-Shaw's translation from the Russian into English of Vvedensky's "Genus Allium in the U. S. S. R. (1935)", with corrigenda by W. T. Stearn. The following named papers were contributed by Stearn: "The Floristic Regions of the U. S. S. R. with reference to the Genus *Allium,*" "Nomenclature and Synonymy of *Allium odorum* and *A. tuberosum*"; a translation into English of Janka's "Key to the Alliums of Europe"; and "Notes on the Genus *Allium* in the Old World." In connection with the discussion in the last named article, Stearn suggested a provisional list of 14 sections to accomodate the *Allium* species as shown in Table 4.

Table 4. Stearn's provisional list of sections for the genus **Allium** (Stearn, 1944 (1946)).

1. **Melanocrommyum** Webb et Berthl. (1848) (nomenifer: **A. nigrum** L.)
2. **Moly Endl.** (1836) (nomenifer: **A. neapolitan** L.)
3. **Briseis** (Salisb.) Stearn (1946) (nomenifer: **A. triquetrum** L.)
4. **Microscordum** Maxim. (1887) (nomenifer: **A. monanthum** Maxim.)
5. **Chamaeprason** F. Hermann (1939) (nomenifer: **A. chamaemoly** L.)
6. **Xanthoprason** F. Hermann (1939) (nomenifer: **A. moly** L.)
7. **Ophioscorodon** (Wallr.) Endl. (1836) (nomenifer: **A. ursinum** L.)
8. **Cepa** (Moench) Prokh. (1931) (nomenifer: **A. cepa** L.)
9. **Phyllodolon** (Salisb.) Prokh. (1931) (nomenifer: **A. fistulosum** L.)
10. **Haemoprason** F. Hermann (1939) (nomenifer: **A. melanantherum** Panc.)
11. **Codonoprasum** (Rchb.) Endl. (1836) (nomenifer: **A. oleraceum** L.)
12. **Rhizirideum** G. Don ex Koch (1837) (nomenifer: **A. senescens** L.)
13. **Anguinum** G. Don ex Koch (1837) (nomenifer: **A. victorialis** L.)
14. **Alliotypus** Dumort. (1827) [=**Allium**] (nomenifer: **A. sativum** L.)

In the following volume of Herbertia, Stearn (1945) published a revised and supplemented version of Hooker's "The Alliums of British India." In 1955, Stearn published a plate on *Allium bulgaricum* in Botanical Magazine. Later, Stearn (1960) published "*Allium* and *Milula* in the Central and Eastern Himalaya," in which he proposed new *Allium* species, and reported the presence of the alliaceous smell in *Milula*; evidence of its affinity with *Allium*.

NORTH AMERICAN ALLIUMS, 1876-1967

At the turn of the century, M. E. Jones (1902) recognized that the North American Alliums should be placed in natural groups. He attempted to establish the ''Reticulatum Group'' centering around *Allium reticulatum* G. Don (1827) = *Allium textile* Nelson & Macbr. (1913). It was not until 1955 that Ownbey stated that the North American *Allium* species with the basic x=7 chromosome number are to be placed in nine alliances (Ownbey & Aase, 1955). In the same paper the species belonging to one of these, the Allium Canadense Alliance, were described. The other alliances were not named. The number of alliances was later reduced to eight (Ownbey, 1966), as shown in Table 5.

Table 5. Alliances of North American **Allium** species with the basic x=7 chromosome number according to Ownbey (1966).

1. Acuminatum Alliance
2. Campanulatum Alliance
3. Canadense Alliance
4. Cernuum Alliance
5. Falcifolium Alliance
6. Kunthii Alliance
7. Sanbornii Alliance
8. Validum Alliance

In order to bring the grouping of the North American Alliums, with the basic x=7 chromosome number, on a coordinate basis with the sections of Old World Alliums, Traub (1967) grouped the species under four sections, including subsections under two sections. Ownbey's Alliances were incorporated in the process by elevating them to subsectional rank as shown in Table 6.

Table 6. The sections and subsections of North American **Allium** species, with the basic x=7 chromosome number, according to Traub (1967, pp. 67; 89-95; 110). Later subsect **Bolanderiana** was added, Traub, 1968b.

- Section I. **CAULORHIZIDEUM** Traub (nomenifer: **A. validum** S. Wats.)
- Section II. **AMERALLIUM** Traub (nomenifer: **A. canadense** L.)
  - Subsection I. **Mexicana** Traub (nomenifer: **A. mexicanum** Traub)
  - Subsection II. **Canadensia** Ownbey ex Traub (nomenifer: **A. canadense** L.)
- Section III. **LOPHIOPRASON** Traub (nomenifer: **A. sanbornii** Wood)
  - Subsection I. **Cernua** Ownbey ex Traub (nomenifer: **A. cernuum** Roth)
  - Subsection II. **Falcifolia** Ownbey ex Traub (nomenifer: **A. falcifolium** Hook. & Arnott)
  - Subsection III. **Sanborniana** Ownbey ex Traub (nomenifer: **A. sanbornii** Wood)
  - Subsection IV. **Acuminata** Ownbey ex Traub (nomenifer: **A. acuminatum** Hook.)
  - Subsection V. **Campanulata** Ownbey ex Traub (nomenifer: **A. campanulatum** S. Wats.)
  - Subsection VI. **Bolanderiana** Traub (nomenifer: **A. bolanderi** S. Wats.)
- Section IV. **RHOPHETOPRASON** Traub (nomenifer: **A. glandulosum** Link & Otto)

II. THE GENUS ALLIUM AS A WHOLE, 1968

The following discussion is concerned with the background for the arrangement of the North American and Old World Alliums on a coordinate basis, including a consideration of (a) the phytogeography or distribution of the genus *Allium* and allied genera; (b) the center of origin of the genus *Allium;* (c) evolution in the genus *Allium;* and (d) the grouping of the species under subgenera, sections and subsections.

DISTRIBUTION OF ALLIUM AND ALLIED GENERA

It has been pointed out by Wulff (1943) that the present distribution of any species is a reflection of the geological revolutions and climatic changes which have occurred on earth during the entire period of its existence. According to Polunin (1960) and S. A. Cain (1944), the vegetation of the aerial parts of the earth tended to be widely comparable in different regions during the earlier geological ages up to and including the Mesozoic, but this relative uniformity was not maintained through the Cenozoic. Marked local changes in conditions were taking place, particularly from the Miocene (beginning 25 million years ago) onwards, and these changes are reflected in the fossil record. These are of great significance in connection with the problem of the origin of the existing floras. However, fossils of monocots are relatively scarce as compared with those of the dicots. *Allium* fossils have not been found, and reliance has to be placed on the distribution of floras in general of which the Alliums are a part.

During the later Cenozoic Era (about 25 to 1 million years in the past) Bering Strait was bridged by a mountain range which apparently had a fairly mature topography which facilitated a general migration of plants and animals over the northeastern Siberian-Alaskan land bridge to North America. Floras were thus practically circumpolar and circumboreal in distribution and were generally spread over the Northern Hemisphere. It is reasonable to assume that along with other plants, the *Allium* species and those of allied genera also had a similar distribution. These included *Milula, Hesperocallis* and most likely other now extinct primitive genera, as well as *Allium,* and other more advanced *Allieae* still existing—*Nothoscordum, Leucocoryne, Tulbaghia, Tristagma, Agapanthus,* and the genera in the Tribe *Gilliesieae.* The circumpolar and circumboreal distribution of *Allium* is corroborated to some extent by the present extensive boreal and arctic range of *Allium schoenoprasum* from Eurasia to North America.

However, the oncoming of the colder conditions with the Pleistocene inter-glacial period, from 1 million to about 15 thousand years in the past in Eurasia and North America, apparently exterminated many of the plants in Eurasia, including practically all of the more primitive *Allium* allies due to being forced against the high east-west mountain ranges to the south. The genus *Milula* was apparently the sole survivor among *Allieae* relicts in Tibet and Nepal, and *Allium* species most likely were drastically reduced in number.

In North America, according to this hypothesis, the plants were also forced southward during the inter-glacial period, but the north-south direction of the mountain ranges facilitated fairly free migration southward of many plant species, including the *Allieae.* It is probable that during this time some of the more primitive genera, not particularly adapted to the new conditions, could have been exterminated, excepting the primitive genus *Hesperocallis* which survives as a relict in southwestern United States.

With the return of more equable conditions following the inter-glacial period about 10 thousand years in the past, immigration northward took place. Thus, *Allium* species apparently returned to the western mountain region in North America, and spread eastward over the plains and prairies, and the relatively low Appalachian highlands to the Atlantic Coast. One allied species, *Nothoscordum bivalve,* spread northward to the midland and eastward to the Atlantic Coast. These migrations are in line with the explanation of the marked similarity between the floras of eastern Asia and eastern North America, first observed by Asa Gray. For instance, a study of the floras of the Island of Yeso, lying north of the main island of Japan, discloses that more than 26 per cent of its plants are found also in North America. It should also be noted that in addition to *Allium schoenoprasum* which ranges from Eurasia to North America, Nothoscordum species are found in Siberia and Japan and also in the eastern United States.

The other allies of the genus *Allium,* including other species of *Nothoscordum, Leucocoryne, Tulbaghia, Tristagma, Agapanthus* and the *Gilliesieae,* apparently did not migrate northward again, apparently having already moved farther south via the Mexican—Central American—Andean highlands (boreal route) as far as Chile and Argentina. The explanation for the occurrence of *Tulbaghia* and *Agapanthus* in South Africa has not been found, and their presence there may possibly be due to the transfer of seeds from South America by birds. The cormous *Brodiaeioidinae* apparently are only distantly related to the *Allieae,* and will not be considered here.

It should be noted that the genus *Allium* has only two surviving monotypic relict relatives—*Milula spicata* Prain ($2n=?$), in Tibet and Nepal; and *Hesperocallis undulata* A. Gray ($2n=24$), in southwestern United States. These relatively primitive *Allium* relatives are characterized by the marker of the alliaceous odor. Morphologically they are not closely similar to *Allium,* but *Milula,* with a scape and the flower spike subtended by a spathe, is nearer to *Allium. Hesperocallis,* with an elongated terminal raceme, may be reminiscent of the mutual ancestral plants which the *Amaryllidaceae* had in common with the *Liliaceae.* Since the relicts occur both in Asia and North America, this may be interpreted as introducing a complicating factor when the matter of the center of origin of *Allium* is considered. However, if interpreted in the light of the phytogeography of the groups concerned, as already explained, any difficulty should be minimized.

CENTER OF ORIGIN OF THE GENUS ALLIUM

Hulten (1937) has pointed out that it is ''unsafe to assume that a plant (group) originates in the place where it has its most numerous relatives. In most cases such a consideration will perhaps be correct, but in others it must be misleading.'' In the present case, the most numerous *Allium* species are in Eurasia-North Africa with a lesser number in North America as has already been indicated. However, this apparently was not true immediately following the inter-glacial period when the floras of Eurasia had been decinated by being forced against the east-west mountain ranges to the south due to glaciation. It should also be indicated that the more numerous related genera are in South America to South Africa, thus presenting a most unusual and complicated problem in plant distribution.

It is reasonable to assume that the distribution of *Allium* species was circumpolar and circumboreal before the inter-glacial period along with the rest of the plants of the Northern Hemisphere. Apparently the floras were drastically reduced during the inter-glacial period in Eurasia due to the east-west direction of the mountain ranges against which the plants were forced by the advancing glaciers, and were largely destroyed. Thus, the present *Allium* flora in this vast area would not be a fair index of what it was in early post-glacial times. The *Allium* species had to be replenished from a remnant after the glaciers had receded.

In North America, the *Allium* species apparently were not subject to such drastic reduction as already explained, and they would serve as a better index of what they were originally. More than 95 per cent of the species in North America have the basic $x=7$ chromosome number. Only two species with the $x_2=8$ basic number, *Allium schoenoprasum* ($2n=16$, 32) and *A. victorialis* ($2n=16$, 32), range from Eurasia to North America. The latter apparently has a common ancestry with the North American, *Allium tricoccum* Ait. ($2n=$—, 32). Thus, it appears that at the time of the oncoming of the inter-glacial period, most of the *Allium* species which had circumpolar and circumboreal distribution had the basic $x=7$ chromosome number. The secondary basic, $x_2=8$ had evolved from $x=7$, but apparently was not numerous among the *Allium* species.

In Eurasia-North Africa today the picture is reversed. *Allium* species with the basic $x=7$ chromosome number constitute only about 10 per cent of the more than 500 species. The rest (more than 88 per cent) practically all have the secondary basic $x_2=8$ number, with only a few having the tertiary basic $x_3=9$, and only two with the quadrinary basic $x_4=10$. How can this be explained?

Apparently, when the survivors from the inter-glacial onslaught began to multiply in Eurasia, the species with the $x_2=8$ basic number, derived from the more primitive $x=7$ species, moved into vast unpopulated areas, and apparently being better adapted to the new conditions, rapidly increased in proportion to the $x=7$ species, so that the proportions of the two have been reversed in comparison with those in North America.

On the basis of phytogeography as defined by Wulff (1943), it appears that the original basic chromosome number of *Allium* is $x=7$, which apparently originated from a now extinct ancestral stock with the basic $x=6$, which it had in common with such a related relict as *Hesperocallis undulata*, $2n=$—, 24 (tetraploid).

The evidence from phytogeography appears to point to $x=7$ as the basic chromosome number in the genus *Allium* but this has to be considered further in connection with other available researches. A final decision can only be made after the evidence from chromosome studies, chemistry, morphology and anatomy has also been evaluated in the following discussion.

EVOLUTION IN THE GENUS ALLIUM L.

Stearn (as quoted by Brat, 1965) has proposed the hypothesis that "the two groups, i.e., the New and Old World species, represent a case of parallel evolution from the proto-*Allium* which was of the rhizomatous kind and the purely bulbous forms, represent an adaptation to environments with a marked seasonal variation of the Mediterranean nature." This view is apparently true in so far as the ancestral stock from which the genus *Allium* originated was rhizomatous and the leaves were oblong and/or petiolate, and that species with bulbous rootstocks and sessile leaves, flat, solid terete, or fistulose, have evolved in response to particular climatic conditions. However, it is hardly possible that the New and Old World species had parallel evolution before the interglacial period when the floras of the North Temperate Zone had a circumboreal distribution. By that time, it appears that the secondary $x_2=8$ basic chromosome number had already evolved from the basic $x=7$ as evidenced by the presence in North America of (a) *Allium tricoccum* Ait. ($2n=$—, 32), a rhizomatous, petiolate-leaved species; (b) *Allium validum* S. Wats. ($2n=$—, 28, 56), an intermediate species, and (c) the more numerous truly bulbous species with flat, terete or furrowed leaves, with the basic $x=7$, basic chromosome number. Since the interglacial period, it is true that the New and Old World Alliums have had an independent development due to the barrier of geographical isolation, but not sufficient time has elapsed to produce really marked differences between the two segments. The North American $x=7$, and Old World Alliums, with *flat* leaves in the Section Molium, for instance, also with the basic $x=7$ chromosome number, usually have a single row of normally oriented vascular bundles and subepidermal laticifers in the leaf blades (Mann, unpubl. mss.; see also Traub, 1968). This surely does not point to parallel evolution of such important features. This leaf character had apparently been evolved before the land bridge between northeastern Asia and North America disappeared. Thus, any independent or parallel evolution of the New and Old World species, not influenced by reticulate hybridization, has to date from post interglacial times. Such developments as the production of flowering-sized terminal bulbs on rhizomes, the old bulb not persisting, as in *Allium glandulosum* and *A. longifolium,* from Mexico, show marked independent evolution, unless the derivation of these features from Old World ancestral stock could be proved. Similarly, the biennial habit of some domesticated forms of *Allium cepa* represent independent evolution under cultivation. Such a development has not been found in natural populations.

Within the genus *Allium,* as shown by the researches of Levan (1932, 1935), Levan and Emsweller (1939), and Mensinkai (1939), evolution is proceeding along three lines on the basis of caryological studies: (1) change in chromosome structure; (2) change in genotype, and (3) change in chromosome number.

CHANGE IN CHROMOSOME STRUCTURE

Structural chromosome changes as a mechanism for variation has relatively great significance and wide application in the evolution of organisms. Its main value lies in the production of rapid evolutionary changes. The chief drawback is that it may lead to sterility. In those cases where it has a high survival value, species evolution is rapid and marked. According to Mensinkai (1939), "Of these, inversions have played a prominent role in *Allium,* as judged from a study of the species . . . (studied). . . . Other changes, such as translocations, fragmentation, fusion, etc., have taken place in these species (which he studied cytologically), though less frequently."

CHANGE IN GENOTYPE

Mensinkai (1939) has reported on a decrease in size of the chromosome complement in *Allium decipiens* (2n=16), and *A. cyaneum* (2n=—, 32), and an increase in size of chromosomes in *A. margaritaceum* (2n=16, 32). He studied a diploid and a tetraploid race of the last named species.

Brat (1965) reported that in *Allium bidwelliae* (2n=14), and the tetraploid, *A. macranthum* (2n=—, 28), the complement shows a distinct size differentiation of the chromosomes into three groups.

CHANGE IN CHROMOSOME NUMBER

After a brief reference to recent progress in the determination of chromosome numbers in *Allium,* reports on change in chromosome number in *Allium* will be briefly considered. Such change in chromosome number is towards (a) euploidy, consisting of the duplication or loss of entire chromosome sets; and (b) aneuploidy, consisting of an increase or decrease by less than an entire chromosome set.

PROGRESS IN DETERMINING CHROMOSOME NUMBERS. Feinbrun (1965) reported that chromosome numbers had been determined for 16 *Allium* species with the x=7; 96 species with the x=8, and 4 species with the x=9, basic numbers. Since that date Aase (1965), and some previous reports, has provided determinations for almost all of the North American *Allium* species. The percentage of Eurasian species for which chromosome numbers have been determined is at least 30 per cent. The progress since 1954 is shown in Table 7, where the percentages of chromosome numbers determined in species with the basic x=7 and x=8, are indicated.

This shows that about 88 per cent of the 111 species with the basic x=7 chromosome number have been determined. It is to be noted that about 73 per cent of the species with the x=7 basic number are diploids (2x). However, for some of these tetraploid (4x) "races" and higher ploidy "races" have also been reported which do not show up in the table. About 4 and 10 per cent of those determined are tetraploids (4x), and higher ploidy, respectively.

Similarly, about a third (35 per cent) of the 521 species with the x=8 basic chromosome number have been determined. About 27 per cent of these are diploids (2x). Again, for some of these tetraploid

(4x) "races" and higher ploidy "races" also have been reported which do not show up in the Table. The percentage of tetraploids (4x) is slightly higher than for species with the x=7 basic number, but the proportion of those with higher ploidy is lower.

The reports for chromosome numbers of the species with the x=7 basic numbers is nearing completion, but much work is needed with the species having the basic $x_2=8$ number. As indicated in the Table, the relatively few species reported with the x=9 and x=10 basic numbers are all diploids (2x).

Table 7. Genus **Allium** L. Percentage of chromosome numbers determined for species with the basic x=7, the secondary basic $x_2=8$ numbers, indicating the percentages of diploids (2x), tetraploids (4x), and higher ploidy ranges. The few species with the tertiary $x_3=9$, and quadrinary, $x_4=10$ basic numbers, are all diploids.

Basic chromosome number; and total number of species:		2x	4x	higher ploidy	total per cent
x=7 (total number of species 111)	per cent of species determined	73.8*	4.1	10.8	88.7
$x_2=8$ (total number of species 521)	per cent of species determined	27.6**	6.5	1.2	35.3

* Includes some reports for tetraploid (4x) and higher ploidy races.
** Includes many reports for tetraploid (4x) and higher ploidy races.

EUPLOIDY IN ALLIUM. Mensinkai (1939) studied 17 Allium species. Six of these are polyploids and all appeared to be allopolyploids which usually are more vigorous in nature than autopolyploids. Mensinkai (1939) points out that in an autopolyploid all the chromosomes of the genome are represented several times over, and thus all of the genes of the species are duplicatd. This results in collective intensification of the characteristics. However, the spontaneous occurrence of structural variations is low, and the chances for new mutants to arise in them are few compared with the allopolyploids. Compared with diploids, autopolyploids when fertile, have greater potentialities for variation by gene mutations. Allopolyploids have the added advantage of having genetically dissimilar chromosomes and the consequent capacity for structural changes as a special mechanism of variation.

ANEUPLOIDY IN ALLIUM. As indicated incidentally earlier in this paper, one of the more significant evolutionary tendencies in Allium is toward establishing a series of supernumerary basic chromosome numbers by means of aneuploidy. This represents a step in the evolution of the genus by insuring incompatibility with neighboring species of differing basic chromosome numbers. This leads to new subgeneric groups in the course of time.

In *Allium,* four such basic numbers have evolved, x=7, x=8, x=9 and x=10. The question arises at once as to which is the primary basic number from which the others have evolved directly or indirectly. The reconstruction of the evolutionary past of the genus *Allium* as far as possible on the basic of phytogeography in earlier discussions appears to point to x=7 as the primary basic number. This has now to be tested on the basis of caryological researches with *Allium* species beginning with Levan (1931), and supporting evidence from chemistry, phenontalogy (morphology), and anatomy.

On the basis of chromosome morphologic considerations, Levan (1935) came to the conclusion that "The karyologically . . . most primitive species of *Allium,* those with 14 chromosomes, have almost exclusively medianly (m) inserted chromosomes. The cytologically most derivative forms, those with 16 chromosomes, have proportionally more chromosomes with terminal (t) insertion." In the same paper, Levan (1935) reported on three species with x=18 chromosome number, and in an earlier paper, Levan (1932) on two 18 chromosome species with "two t or st chromosomes per genome and thus may be easily derived from the 16 chromosome species (of *Allium,* and *Nothoscordum*) by segmentation of one m chromosome per genome. Such segmentations are actually still occurring in the (related) *Nothoscordum"* (Levan & Emsweller, 1938). It is to be noted that the reasoning is based on mechanisms that are still occurring in *Allium* and the related *Nothoscordum.*

Eid (1963) studied the chromosome morphology of *Allium neapolitanum* (x=7), *A. roseum* (x=8) and *A. zebdanense* (x=9), all Mediterranean species which have been placed in Section Molium in the past. In *A. neapolitanum* the chromosomes are metacentric, but in the latter two species teleocentrics are also present. Eid concluded that in this case the basic numbers form an ascending series since the teleocentrics have been derived through misdivision of the metacentric chromosomes of the basic x=7.

Results reported by Saghir (Ph.D. thesis, 1964) indicate that "the majority of the species of the section Molium have the basic x=7 chromosome number and contain a relatively high proportion of methyl sulfide and a low proportion of allyl sulfide, but in *A. roseum* (x=8) and *A. zebdanense* (x=9) the proportion of the methyl radical in the vapor of these two species is smaller and the proportion of the allyl radical is larger than in the species with the basic x=7 number, which indicates a similarity between them and suggests the possibility of their being derived.

In the same work (Saghir, 1964), the leaf anatomy of *A. roseum* (x=8) and *A. zebdanense* (x=9) is typical of that of the species with the basic x=7 chromosome number—one row of vascular bundles and the laticifers located subepidermally. This again suggests that x=8 and x=9 are derived from x=7. In section *Melanocrommyum,* all of the species have the x=8, except one, *A. karateviense,* which has the basic x=9 chromosome number. The leaf anatomy of this species is typical of that of the x=8 species—there are two rows of vascular bundles and the laticifers are embedded in the mesophyll. This again suggests that x=9 may be derived from x=8.

On the basis of these results from chemistry and anatomy, Saghir concluded that they lend support to the work of Levan (1932, 1935), Levan & Emsweller (1939), (also Eid, 1965) to the effect that the primitive basic chromosome number in *Allium* is x=7, and that x=8 and x=9 are derived from the first either directly or indirectly.

In contrast to the results just summarized, Mensinkai (1940) and Brat (1965) have reached opposing views.

Mensinkai (1940) states that "8 appears to be the most primitive number since 90 per cent of the species in the list (as of 1939, which he appends) have 8 or its multiple as their haploid number." As indicated earlier, in the light of phytogeography, there is no warrant in believing that this is so merely because 90 per cent of the species in the list he made have the basic x=8 chromosome number. All of Mensinkai's caryological explanations for the derivation of x=7 and x=9 from x=8 are highly speculative and are not based on observable tendencies within the genus *Allium* and the related *Nothoscordum*, and Mensinkai's explanation cannot displace Levan's and Eid's evidence from caryology, and which is based upon observable mechanisms within the genus *Allium*.

Brat (1965) suggests that in considering the basic chromosome numbers in *Allium* it is important to work within groups which inhabit particular centers of distribution. In the section *Codonoprason* most of the species have the basic x=8 chromosome number, and only two species, *A. fuscum* (x=7) and *A. pseudoflavum* (x=9), are atypical in the group. He suggests that the single x=7 and x=9 species were derived from the x=8 species which are the norm (larger in number) in the group. He has apparently overlooked the role of phytogeography as already detailed, and in so doing has assumed with Mensinkai (1940) that since most of the species in *Codonoprason* have the x=8 number, it follows that the few exceptions have been derived from x=8 simply because there are more x=8 species. He derived x=9 from x=8 again, for the same wrong reason.

The evidence from phytogeography as presented earlier in the present paper is apparently in harmony with the evidence presented by Levan (1932, 1935), Levan & Emsweller (1938), and Eid (1965) on a caryological basis, and the results reported by Saghir (1964) on the basis of chemistry, and anatomy. Thus we are justified in accepting x=7 as the primary basic number in *Allium* since the preponderance of evidence supports it.

MAKING A GROUPING CHOICE

Although *Allium* species with the basic x=7 and x_2=8 basic chromosome numbers may be growing side by side, they are each evolving in separate directions as shown for *Allium neapolitanum* (x=7), of the Section *Molium*, and *A. roseum* (x_2=8) which also has been placed in the same Section, to mention only one instance. They have different proportions of methyl and allyl volatiles (Saghir, 1965). With the passing of time, other differences have most likely appeared, and others will show up in the future due to further evolution.

Once a series of basic chromosome numbers has evolved in a genus, each member of the series tends to be effectively isolated from the others. This usually rules out reticulate hybridization between species in the separate groups under ordinary conditions. Such isolated groups may provide a natural basis for the recognition of subgenera within the genus. In such a genus as *Allium* L. with over 650 species, it is a practical necessity to subdivide it to the extent warranted by the facts in order that it may be understood.

In *Allium,* with the *primary basic* $x=7$ chromosome number, the *secondary,* $x_2=8$ basic number apparently has been derived at various times from the primary basic number before and after the inter-glacial period. Those derived earlier and later apparently may potentially interbreed under ordinary conditions. Thus, they each form a natural group with members that differ phenontologically in some particulars. The $x_2=8$ species have no future on a genetic basis with any species with the $x=7$ basic number, and the group can be considered as a natural one so long as potential reticulate hybridization is inherent within it. The same observations may be made for the derived groups with the tertiary, $x_3=9$, and *quadrinary,* $x_4=10$, basic numbers.

The genus *Allium* may be grouped into at least three natural subgenera (see Traub, 1968b) due to a significant relationship between the basic chromosome numbers and the number and orientation of vascular bundles in the leaf blade; (to which may be added the number of nerves in the floral tepals), as indicated in Table 8.

Table 8. Genus **Allium** L.: grouping into subgenera using the basic (x) chromosome numbers, the number and orientation of leaf vascular bundles, and the number of nerves in the floral tepals, as criteria.

Subgenus	basic chromosome numbers (x) of species	foliage leaf blade; vasc. bundles; number of rows; orientation	floral tepals; number of nerves
I. **AMERALLIUM**	$x=7$, except a few $x_2=8$ and $x_3=9$	in one row with few exceptions	1-nerved
II. **NECTAROSCORDUM** ..	$x_2=8$	in one row	3—7-nerved
III. **ALLIUM**	$x=8$, except a few ($x=7$?) $x_3=9$ and $x_4=10$	(a) in flat or furrowed leaves, 2 opposed rows; (b) in fistulose * leaves, 1 circular row; or 1 irregular circular row (or 2?)	1-nerved

* No species with terete (solid) leaves have been studied so far.

An explanation apparently is in order with reference to the few exceptions noted in two of the subgenera. The evolutionary path is *asymmetrical* and never repeats itself; and it is natural that exceptions should be noted. In subgenus I. *Amerallium,* for instance, the few $x_2=8$ and $x_3=9$ species can be retained for practical reasons with the usual $x=7$ species. They are still similar to the latter in various phenontological characters since not sufficient time has elapsed for marked changes. The same can be said for similar exceptions in subgenus

III. *Allium.* Those who are not satisfied with the present grouping may wish to place the species into four subgenera according to the basic chromosome numbers, $x=7$, $x_2=8$, $x_3=9$ and $x_4=10$. Such a grouping may have some practical advantages for it would stimulate work on the determination of chromosome numbers in order to know where each species belongs. However, for the present, it appears best to proceed as outlined (see Table 8). The number of exceptions encountered is relatively small, and they can be dealt with as deviations that show evolutionary trends within the subgenera, apart from those exhibited by the usual potentially and actually interbreeding members of the population.

KEY TO THE SUBGENERA, SECTIONS AND SUBSECTIONS OF **ALLIUM** L.

In the following tentative key, the subgenera under *Allium* L. are arranged in conformity with the grouping choice indicated in the previous discussion. The subgenera are based primiarily on the basic (x) chromosome numbers, recognizing a few exceptions in each case. Within the subgenera, the grouping is on the phenontological[1] basis.

The subgenera are according to Traub (1968b) as explained earlier in this paper. Sections I—IV, including the North American *Allium* species with the basic $x=7$ chromosome number, are according to Traub (1967, and 1968a); the subsections are based mainly on the Alliances of Ownbey (1966).

Sections V—XVIII, including Old World species, with a few North American representatives are (a) based in the first instance on those of Stearn (1946); (b) with some changes and/or additions according to L. K. Mann in 1957, and as modified by him, assisted by Miss Dora G. Hunt, up to 1963; and (c) with further changes, additions and the inclusion of the reported chromosome numbers of the nomenifer species up to 1965; and the rearrangement of the whole on a tentative evolutionary sequence according to Traub.

1a. Species with the basic $x=7$ chromosome number, with a few having the $x_2=8$ and $x_3=9$ basic numbers; about 75% North American, the rest Old World species.

SUBGENUS I. **AMERALLIUM** TRAUB, **SUBG. NOV.**

Subgenus **Amerallium** Traub, **subgenus nov.,** (Amaryllidac.)

Species numero basali chromosomorum $x=7$ possidentes; species pauces numero basali $x_2=8$ et $x_3=9$ possidentes; numero basali chromosomorum cum dispositione in linea singula fasciculorum vasculorum folii conjuncto. Typus: **Allium canadense** L. $2n=14$, 28

2a. North American species with the basic $x=7$ chromosome number:

3a. Plants reproducing by means of seeds, or bulblets in the umbel, or by bulb offsets; rarely by seeds alone; when new bulbs are borne terminally on rhizomes, the old bulbs persist, excepting in **A. bolanderi** and **A. unifolium** under Sect. III, subsect. VI; (see also Sect. IV, below).

4a. Bulbs appearing in tufts, produced on stout Iris-like rhizomes, except sometimes smaller in young plants; bulb coats membranous striate with elongate cells in regular vertical rows, and persistent parallel fibers; leaves several, flat, blunt, shorter than the scape; ovaries crestless, except in **A. erotophyllum**; flowers pink:
Section I. **CAULORHIZIDEUM** Traub, in Plant Life 23: 69. 1967;

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[1] The term, **phenontological,** is used in preference to the usual term, **morphological,** because not only form but also all other heritable characters are included (see Traub, 1964), such as anatomy, chemical composition, method of vegetative propagation (physiology), color, odor, taste, etc.

syn.-Allium Validum Alliance, Ownbey (1966). Nomenifer: **Allium validum** S. Wats. **2n=—, 28, 56**

4b. Rhizomes often absent, or if present, then elongated, or reduced in size:

5a. Ovary crested or not crested; bulb coats membranous, or with a persistent reticulum of fibers:

Section II. **AMERALLIUM** (Plant Life 23: 89-95. 1967; nomenifer: **Allium canadense** L. **2n=14, 28).**

6a. Bulb coats thin, papery ,with indistinct vertical fibers; ovary crestless or crested:

Subsection I. **MEXICANA** Traub, Plant Life 23: 89-95. 1967, **anglise (Mexicanae)**; ibid. 24: 135. 1968. Nomenifer: **Allium mexicanum** Traub, **2n=?.**

6b. Bulb coats with a persistent reticulum of fibers; ovary crestless or crested:

Subsection II. **CANADENSIA** Ownbey ex Traub, in Plant Life 23: 89, 95. 1967, **(Canadenase)**; syn.-Allium Canadense Alliance, Ownbey (1966), **anglise.** Nomenifer: **Allium canadense** L. **2n=14, 28.**

5b. Ovary crests present (except in **A. lacunosum** and **A. hyalinum**), bulb coats membranous; secondary development of the inner epidermal cells of the inner bulb coats; or not characterized by such development:

Section III. **LOPHIOPRASON** Traub, in Plant Life 23: 69. 1967 Nomenifer: **Allium sanbornii** Wood; **2n=14.**

7a. Plants reproducing by seeds or offsets, or by bulbs on terminal rhizomes, the old bulbs persisting:

8a. Species not marked by the secondary development of the inner epidermal cells of the inner bulb coats:

9a. Leaves 2 or more, rarely 1, per scape:

10a. Leaves 2 (or 1) per scape, often flat or falcate; crests usually poorly developed; scape usually flattened, often strongly so; with "tumble weed" type of seed dispersal; mostly xerophytic:

Subsection I. **FALCIFOLIA** Ownbey ex Traub, in Plant Life 23: 69. 1967; syn.-Allium Falcifolium Alliance, Ownbey (1966), **anglise.** Nomenifer: **Allium falcifolium** Hook. & Arnott; **2n=14.**

10b. Leaves more than 2 (several) per scape; ovary crested; bulbs mostly elongate; scape decurved near apex:

Subsection II. **CERNUA** Ownbey ex Traub, in Plant Life 23: 69. 1967; syn.-Allium Cernuum Alliance, Ownbey (1966), **anglise.** Nomenifer: **Allium cernuum** Roth & Roem. **2n=14.**

9b. Leaf solitary per scape, except leaves 2 per scape in **A. bieglovii**; ovary prominently crested with members often lacerate; xerophytic:

Subsection III. **SANBORNIANA** Ownbey ex Traub, in Plant Life 23: 69. 1967; syn.-Allium Sanbornii Alliance, Ownbey (1966), **anglise.** Nomenifer: **Allium sanbornii** Wood; **2n=14.**

8b. Species usually marked by the secondary development of the inner epidermal cells of the inner bulb coats:

11a. Leaves 2—4, rarely 1, per scape, ovary usually inconspicuously crested (except crests replaced by an obtuse, thickened ridge in **A. lacunosum**, or crests absent in **A. hyalinum**); the inner epidermis of the inner bulb coats usually becoming thickened, forming a moisture-retaining membrane with cellular markings characteristic of the species; xerophytic:

Subsection IV. **ACUMINATA** Ownbey ex Traub, in Plant Life 23: 69. 1967; syn.-Allium Acuminatum Alliance, Ownbey (1966), **anglise.** Nomenifer: **Allium acuminatum** Hook. **2n=14.**

11b. Leaves 2 per scape; ovary conspicuously crested; bulbs small, spherical; with usually sinuous walls (cleft or recessed) on the inner epidermal cells of the inner bulb coats; mesophytic:

Subsection V. **CAMPANULATA** Ownbey ex Traub, in Plant Life 23: 69. 1967; syn.-Allium Campanulatum Alliance, Ownbey (1966), **anglise.** Nomenifer: **Allium campanulatum** S. Wats. **2n=14.**

7b. Bulbs arising, or sometimes arising, terminally on a stout lateral rhizome, the old bulbs not persisting in the process (see also Sect. **Rhophetoprason,** below):

Subsection VI. **BOLANDERIANA** Traub, **subsect. nov.**

Subsection **Bolanderiana** Traub, **subsect. nov.,** Sect. **Lophioprason,** genus **Allium** L.

Tunicae bulborum reticulatae, reticulis obscuris angustis horizontalibus vel transverse serratis; bulbis semper vel interdum rhizomas laterales terminantibus, bulbis vetustis non persistentibus. Typus: **Allium bolanderi** S. Wats. **2n=14.**

3b. Plants reproducing by seeds, and by producing flowering-sized bulbs terminally on rhizomes, the old bulbs not persisting; bulb coats membranous, sparsely vertically veined with fibers; leaves 4—5 or more, prominently sheathing below:

Section IV. **RHOPHETOPRASON** Traub, in Plant Life 23: 110. 1967, **anglise;** ibid. 24: 141. 1968. Nomenifer: **Allium glandulosum** Link & Otto; **2n=—, 28.**

2b. Old World species with usually the x=7 basic chromosome number, including a few species with the $x_2=8$ and $x_3=9$ basic chromosome numbers:

12a. Scape not triquetrous:

13a. Floral umbel not nesting in the center of the leaves:

Section V. **MOLIUM** Endl. (1836). Nomenifer: **Allium neapolitanum** L. 2n=14, 28.

Section VI. **XANTHOPRASON** F. Hermann (1939). Nomenifer: **Allium moly** L. 2n=14.

13b. Floral umbel nesting in the center of the leaves, which lie on the ground; minute species; leaves 4 narrow, umbel 4-flowered; flowers white:

Section VII. **CHAMAEPRASON** F. Hermann (1939). Nomenifer: **Allium chamaemoly** L. **2n=?**

12b. Scape triquetrous:

Section VIII. **OPHIOSCORDON** (Wallr.) Endl. (1836). Nomenifer: **Allium ursinum** L. **2n=14.**

14a. Leaves oblong, acuminate at both ends:

Subsection I. **URSINA** (nomenifer: **Allium ursinum** L. **2n=14.**)

14b. Leaves petiolate, blade sharply keeled; stamen-filaments very narrow, inserted in two series; seeds arillated.

Subsection II. **TRIQUITRA** (nomenifer: **Allium triquetrum** L. **2n=18;** note also **Allium pendulinum** Ten. **2n=14, 18; A. paradoxum** (M.B.) G. Don; **2n=16)**

1b. Species with the basic $x_2=8$ chromosome number, with a few exceptions having $x_3=9$, and $x_4=10$ basic numbers ;all Old World species, except one North American species, and a few North American subgroups of Old World species:

15a. Tepals 3—7-nerved; seeds 8—11 per locule; pedicels markedly discoidally swollen at the apex:
SUBGENUS II. **NECTAROSCORDUM** (Lindl.) Traub. **comb. nov.,**
Syn.-genus **Nectaroscordum** Lindl., Bot. Reg. 9: pl. 1912. 1836.
Nomenifer: **Allium siculum** Ucria, 2n=16.
Section IX. **NECTAROSCORDUM**

15b. Tepals 1-nerved; pedicels, if at all, only slightly swollen at the apex:
SUBGENUS III. **ALLIUM** (nomenifer: **Allium sativum** L., 2n=16, 48)

16a. Leaves not fistulose:

17a. Leaves oval to petiolate:
Section X. **ANGUINUM** G. Don ex Koch (1837); Nomenifer: **Allium victorialis** L. **2n=16, 32**

17b. Leaves not oval to petiolate:

18a. Umbel more than 2-flowered:
Section XI. **RHIZIRIDEUM** G. Don ex Koch (1837); nomenifer: **Allium senescens** L. **2n=—, 32, 48.**
Subsection I. **TUBEROSA** (nomenifer: **Allium tuberosum** Rott. ex Spreng. **2n=16, 32.**)
Subsection II. **INDERIENSIA** (nomenifer: **A. inderiense** Fisch. ex Bunge, **2n=?**)
Subsection III. **SENESCENSIA** (nomenifer: **A. senescens** L. **2n=—, 32, 48.**)
Subsection IV. **SIKKIMENSIA** (nomenifer: **A. sikkimense** Bak. **2n=—, 32.**)
Section XII. **MELANOCROMMYUM** Webb & Berth. (1843); nomenifer: **A. nigrum** L. **2n=16.**
Section XIII. **CODONOPRASON** (Rchb.) Endl. (1836); nomenifer: **A. oleraceum** L. **2n=—, 32, 40.**
Section XIV. **PETROPRASON** F. Hermann (1939), nomenifer: **A. obliquum** L. **2n=16.**
Section XV. **ALLIUM** (nomenifer: **A. sativum** L. 2n=16.)
Section XVI. **HAEMOPRASON** F. Hermann (1939); nomenifer: **A. melanantherum** Panc. **2n=?**)

18b. Umbel 1-, rarely 2-flowered; plant small, delicate, slight alliaceous odor; leaves 1—2, nesting on the ground; style 3-lobed nearly to the middle:
Section XVII. **MICROSCORDUM** Maxim. (1887); nomenifer: **A. monanthum** maxim. **2n=16, 32.**

16b. Leaves fistulose:
Section XVIII. **CEPA** (Moench) Prokh. (1931); nomenifer: **A. cepa** L. **2n=16, 32.**
Subsection I. **CEPA**; nomenifer: **A. cepa** L. **2n=16, 32.**
Subsection II. **FISTULOSA**; Nomenifer: **A. fistulosum** L. **2n=16.**
Subsection III. **SCHOENOPRASA** (nomenifer: **A. schoenoprasum** L. **2n=16, 32.**)
Subsection IV. **POPOVIANA** (nomenifer: **A. popovii** Vved. **2n=16.**)

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THE INHERITANCE OF MELON FLOWER COLOR IN **HEMEROCALLIS WASHINGTONIA**

Hamilton P. Traub, G. W. Bohn and Thomas W. Whitaker

There is a paucity of information concerning the inheritance of flower color in *Hemerocallis*. The following note records some observations of flower color in the allotetraploid *H. washingtonia* (Traub, 1951, 1959, 1960) which we hope will be helpful to breeders investigating these problems. The gene or genes responsible for melon flower color (color similar to the flesh of a cantaloupe) are widely distributed in hybrid diploid *Hemerocallis* species (2n=22). For example, it occurs in the clones 'Frances Fay', 'Satin Glass', and others. It also occurs in the allotetraploid *H. washingtonia* (2n=44) derived from similar diploids. Melon flower color in its yellow or pastel form appears in progenies of both diploids and the tetraploid, but no studies have been made of its inheritance.

During 1964 a tetraploid "melon" seedling was pollinated by a tetraploid "mulberry purple" seedling. The seeds were planted in December 1964, and the seedlings transplanted to the field in February, 1965. A few of the seedlings flowered in August, 1965, and the remainder in the spring and summer of 1966. The results are shown in Table 1.

Table 1. Progeny from the cross melon x mulberry purple in **Hemerocallis washingtonia.**

Flower Color		Observed	Expected	Chi-square
Melon				
yellowish melon		6		
pastel melon		3		
	Total	9	7.25	0.4224
Purple				
deep purple		6		
red purple		101		
	Total	107	108.75	0.0281
Totals		116	116.00	0.4505

If the two shades of melon flower color and the two shades of purple are combined, the calculations show a non-significant chi-square, assuming two factor segregation in the tetraploid *H. washingtonia*. It is also assumed that only the full recessive exhibits the melon phenotype. This interpretation is merely tentative. Selfing and backcrossing of selected melon and purple phenotypes would be required to establish the hypothesis. Unfortunately most siblings are self-sterile and cross sterile. With non-siblings, however, fertile matings occur so that the project could be carried forward by propagating these combinations. It is hoped these few observations will stimulate others engaged in breeding *Hemerocallis* particularly *H. washingtonia,* to report their results.

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PLANT LIFE LIBRARY

INTRODUCTION TO PLANT BREEDING, by Fred N. Briggs and P. F. Knowles. Reinhold Publishing Corporation, New York. 1967. 426 pp. $12.50. It seems trite to state that the test and later success of any textbook can be measured by its capability to fill the niche for which it was designed. This textbook by the late Dean F. N. Briggs and Prof. P. F. Knowles, both of the Davis Campus of the University of California, has been specifically tailored to satisfy the needs of advanced undergraduates for a course in plant breeding. In the opinion of the reviewer, *Introduction to Plant Breeding,* is admirably designed to meet this challenge.

A glance at the title and sub-titles of the 30 chapters of the book suggests furthermore, that the prospective student before attempting to use this book should be well grounded in the biological sciences, particularly genetics, botany, and perhaps some phase of crop production. If we assume a student has these requirements, Chapter 4 (Mode of Reproduction in Relation to Plant Breeding Methods) could be eliminated, since much of this material is covered in elementary courses in Botany and perhaps elsewhere. The same might also be said of Chapters 5 and 30, which are concerned with statistics, but here Prof. Knowles makes a compelling case for including some statistics in an undergraduate text on plant breeding.

A pleasant and instructive innovation are the quotations that follow each chapter heading. These quotations from such varied authorities as Darwin, Walt Whitman, E. R. Sears, and Paul Mangelsdorf set the theme for the ensuing chapter. The Résumé of each chapter, followed by an abundant list of pertinent references are helpful pedagogical aids. It is disappointing to note that the authors have not included a set of questions for discussion or problems for solution at the end of each chapter. Discussion and problems are proven techniques for assisting the motivated student to acquire an understanding of a subject. Surely, they would have improved a textbook of Plant Breeding.

Coverage of the principles and methods of plant breeding is current and comprehensive. There is an Appendix of three statistical tables, and a sixteen page Index.—*Thomas W. Whitaker.*

ORIGINS OF MENDELISM, by Robert C. Olby. Schocken Books, New York. 1966. 204 pp. $6.95. This scholarly, well-written book by Dr. Robert C. Olby, Librarian, Botany School, Oxford University, Oxford, England, dissipates under a load of evidence the widespread myth that Gregor Mendel, the gentle Austrian monk and founder of genetics, worked in a vacuum, and owed nothing to his predecessors or contemporaries. Olby's researches clearly show that the success of Mendel's work was not an isolated phenomena, but the culmination of a series of studies commencing with the classical hybridization experiments of Koelreuter about a century before Mendel's paper was published. This is not to denigrate Mendel or his achievements. Mendel, although a shy and humble man, probably had one of the most brilliant and creative minds in the entire history of Biology, and he used it well.

Olby's carefully documented research reveals that Mendel's approach to biology was primarily that of a physicist. This is not surprising since much of his training at the University of Vienna was in experimental physics, the use of physical apparatus, and the mathematical analysis of physical problems. Furthermore, for a number of years he was an instructor in physics and natural philosophy at the technical high school in Brno. Olby suggests that Mendel looked upon his famous hybridization experiments with peas much as he would a classroom demonstration in physics. As Olby shows, this explains in part Sir Ronald A. Fisher's criticism of Mendel's results.

This book is important because it analyzes in detail what might be called the life and times of Mendel; the reasons why his work was ignored for a period of over 30 years, and finally the setting in which the work was rediscovered. Although Olby does not mention it, his meticulous research strongly suggests that there were really only two rediscoverers of Mendel's work, de Vries and Correns. It is clear that de Vries and Correns independently performed experiments that supported Mendel's results when they came upon his paper, "Experiments on Plant Hybrids," published in 1866. Furthermore, de Vries and Correns developed an interpretation to explain their data. On the other hand, there is no evidence that Tschermak (the third codiscoverer) had a real understanding of the Mendelian rules of heredity.

Professor C. D. Darlington has written a provocative Foreword. It is characteristic undiluted Darlingtoniana, fresh, suggestive, perhaps not always correct in detail, but invariably stimulating. Even Prof. Darlington's sharpest critics have never accused him of being dull. There is an Index, and an Appendix to each Chapter collected in the rear of the book. To avoid extensive documentation in the text, pertinent quotations from such well known biologists as Koelreuter, Buffon, Amici, Galton, Fisher and others, are assembled in the Appendices.

The Origins of Mendelism makes pleasant reading, and if one is curious about the development of great ideas in science and their subsequent reception, this book supplies a detailed documentary of the entire process. With this book along with the excellent, "Origin of Genetics—A Mendel Source Book," by Stern and Sherwood, we have a complete record, or as complete as it is ever likely to be, of all aspects of the Mendelian story.—*Thomas W. Whitaker*

GENETIK UND ZYTOLOGIE VON ANTIRRHINUM L. SECT. ANTIRRHINUM, by Hans Stubbe. Veb Gustav Fischer Verlag, Jena. 1966. 421 pp. 82 dr. For those fortunate individuals fluent in German, and interested in genetics and cytology, reading this book of 421 pages by Prof. Hans Stubbe could be a rewarding experience. Packed with information, not only about the genetics and cytology of *Antirrhinum,* but also the systematics, distribution, morphology, and ecology of the genus, it is a fitting monument to Prof. Stubbe's consistent record of high level research. Truly a *magnum opus,* Prof. Stubbe has dedicated the book to his teachers, Erwin Bauer and Fritz von Wettstein, those giants of German biology of the early part of this century. Bauer commenced investigations with *Antirrhinum* about 1906; the latest paper cited by Stubbe was published in 1963; thus the book covers nearly 60 years of experimental work with snapdragons. Lest anyone think Stubbe was not an active participant in these investigations, an inspection of the list of literature cited shows that he is the author of more than 30 papers specifically concerned with *Antirrhinum* genetics. The book is indeed a classic example of the thoroughness and best in German scholarship.—*Thomas W. Whitaker*

INVESTIGATIONS INTO GENERATION 1651-1828, by Elizabeth B. Gasking. The Johns Hopkins Press, Baltimore. 1967. 192 pp. $6.00. This scholarly, meticulous history of sexual generation from 1651 when William Harvey published his *De Generatione* up to 1828 when von Baer discovered the mammalian egg is authored by an Australian, Dr. Elizabeth Gasking of the Department of History and Philosophy of Science, University of Melbourne, Melbourne. Dr. Gasking has done her homework well. The book is copiously documented; there is a Bibliography of 101 references, and adequate Index, and a Time Chart of the history of generation from 1651 to 1915.

The word "Generation" in the title may puzzle the layman, and even the modern biologist. Dr. Gasking explains that "Generation" in its restricted sense was the term applied to the coming into existence of new individual organisms both animal and plant, regardless of the method involved. Gradually the meaning of the term was broadened to include the problems of organic growth and differentiation. After being used from antiquity until the beginning of the nineteenth century the word "Generation", through some accident of history, fell into disfavor and gradually into disuse, although there continued to be no lack of interest in the problems it formerly designated. In fact, these problems have achieved some semblance of unity in modern genetics.

Dr. Gasking is concerned primarily with the theoretical opinions advanced by influential biologists, and the investigations which moulded their opinions, and determined their outlook. The distinguished array of early experimental biologists whose work is extensively analyzed, includes in addition to William Harvey; Maupertuis, Wolff, Haller, Bonnet, Spallanzani, von Baer and several others. Present day biologists curious about what their precursors were doing and thinking during the late seventeenth and eighteenth centuries can turn to Gasking's book for an authoritative answer.

Despite the fact that the period covered was one of the most exciting in the entire history of biology, I found the book difficult to read, and occasionally downright dull. Dr. Gasking's writing is on the whole pedestrian and lacks the sparkle and zest needed to hold her readers, even though her scholarship may be impeccable. *—Thomas W. Whitaker*

PLANT LIFE LIBRARY—continued on page vi.

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For the roster of the general officers of the Society, the reader is referred to the inside front cover of this volume.

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[AMERICAN AMARYLLIS SOCIETY, continued from page 2.]

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This is required reading for every amaryllid enthusiast.

2. DESCRIPTIVE CATALOG OF HEMEROCALLIS CLONES, 1893—1948, by Norton, Stuntz, and Ballard. A total of 2695 Hemerocallis clones are included and also an interesting foreword, and explanatory section about naming daylilies. Manila covers; 100 pages (1—X; 1—90), includes a portrait of George Yeld. $5.00 postpaid.

3. THE GENERA OF AMARYLLIDACEAE, by Hamilton P. Traub. Includes a general introduction, a key to the subfamilies, infrafamilies, tribes, subtribes and genera of the Amaryllidaceae, and descriptions of all the genera. Every member of the Society should have this book for constant reference. Manila covers; publ. 1963; 85 pages. $5.00 postpaid.

4. LINEAGICS, Hamilton P. Traub. This is the first outline text for the undergraduate student on the grouping of organisms into lineages. The text is divided into four parts: (a) the history of lineagics and lineagics as an integrated science; (b) basic lineagics, principles and procedures; (c) applied lineagics, principles and procedures; and (d) research methods in lineagics. Recommended for the student in biology. Publ. 1964. Manila covers, 163 pages, incl. 8 illus. $5.00 postpaid.

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PLANT LIFE

VOLUME 25

[Nos. 1-4, Jan., Apr., Jul. & Oct.]

1969

EDITED BY
HAMILTON P. TRAUB
HAROLD N. MOLDENKE

THE AMERICAN PLANT LIFE SOCIETY
Box 150, La Jolla, California 92037

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CORRIGENDA

PLANT LIFE, Vol. 23, 1967

Page 61, 18th line, change ‘‘E. L. Brasol, near Daytona Beach, Florida’’ to ‘‘a collector in eastern peninsular Florida’’.

Page 67, center of page, *Narcissus tazetta* subsp. *chinensis* var. *‘‘pleniflorus’’*, 4th line, change ‘‘11-16-50’’ to ‘‘1-16-50 a+b+c’’.

SUPPLEMENT—REVIEW OF THE GENUS NERINE (see also corrigenda PLANT LIFE Vol. 24. 1968 p. vi.)

Page 3, 12th line from bottom of text, change ‘‘Winsome F. Baker’’ to ‘‘Winsome F. Barker’’.

Page 10, change ‘‘7. *rydleyi*’’ to ‘‘7. *ridleyi*’’.

Page 16, 12th line from bottom, change ‘‘1805’’ to ‘‘1905’’.

Page 19, 3rd line from top, change ‘‘*rydleyi*’’ to ‘‘*ridleyi*’’.

11th line from bottom, change ‘‘rose pink’’ to ‘‘mauve pink’’.

Page 21, under ‘‘11. *Nerine alta* (err. *alata*).

8th line from bottom, change ‘‘(Hogsbeck)’’ to ‘‘(Hogsback)’’.

14 to 15th line from bottom, change ‘‘Hogsbeck’’ to ‘‘Hogsback’’.

Page 23, 13th line from top, change ‘‘Prof. T. Baron’’ to ‘‘Prof. T. T. Barnard’’.

Page 24, under 16. *Nerine brachystemon*, 1st line, change ‘‘Bulb unknown’’ to ‘‘Bulb ovoid, rather small.’’

PLANT LIFE, Vol. 24, 1968

Page 50, Fig. 14, 2nd and 3rd lines, change ‘‘Sultinate’’ to ‘‘Sultanate’’.

Page 127, 14th line from bottom, change ‘‘(1841)’’ to ‘‘(1823-31)’’.

Page 130, 18th line from top, change ‘‘holonomenifer’’ to ‘‘lectonomenifer’’.

Page 134, in the key, under 19a, 3rd line, change ‘‘14. *michoacanense*’’ to ‘‘14. *michoacanum*’’.

Page 136, under 2. *Allium scaposum*, 10th line, change ‘‘tepals 6 cm. long’’ to ‘‘tepals 6 mm. long.’’

Page 139, under 11. *Allium ownbeyi*; Range.—, change "about 30 mi. north of Monterrey" to "within western edge of City of Monterrey." See also Plant Life 25:56. 1969. Under 13. *Allium elmendorfii,* 2nd line, change "Allium elmandorfii" to "Allium elmendorfii".

Page 141, under 19. *Allium glandulosum,* 2nd line, change "1841" to "1828-31".

Page 154, 19th line from bottom, change "Feinbrun (1965)" to "Feinbrun (1954)".

Page 159, from bottom of text, 2nd line up, change *"erotophyllum"* to *"eurotophilum"*.

Page 162, 6th line from bottom, change "Feinbrun, N. Palest, J. Bot. Jerusalem 5:13. 1950" to "Feinbrun, N. Caryologia, Vol. suppl. 1954, pp. 1036-1041."

LINEAGICS, BY HAMILTON P. TRAUB

Published Aug. 6, 1964

CORRIGENDA

(See also Corrigenda PLANT LIFE Vol. 21, 1965, pp. vi.—vii.)

Page 18, 12th line from top, for "Mauterpuis" read "Maupertuis".
16th line from top, for "Mauterpuis" read "Maupertuis".

Page 26, 12th line from top, change "cretaceans" to "cetaceans".

Page 35, 23rd line from bottom, change "Mauterpuis" to "Maupertuis".

Page 36, 3rd line from bottom, change "Mauterpuis" to "Maupertuis".
7th line from bottom, change "Mauterpuis" to "Maupertuis".

Page 37, 10th line from top, change "Mauterpuis" to "Maupertuis".
7th line from bottom, change "Mauterpuis" to "Maupertuis".

Page 36, 1st paragraph, 1st line, change "Mauterpuis" to "Maupertuis".
2nd paragraph, 6th line, change "Mauterpuis" to "Maupertuis".

Page 48, 18th line from top, change "Wilheim" to "Wilhelm".

Page 58, 1st line, change, "Mauterpuis" to "Maupertuis".

Page 62, Fig. 2, 4th line, change "mathematices" to "mathematics".

Page 64, 13th line, change "basic" to "basis".
17th line from top, change "fall" into "falls".

Page 97, 4th line from bottom, insert "to" after "closely".

Page 107, 1st paragraph, 7th line, change "are" to "is".

Page 112, 1st line, change "Methanabacae" to "Methanobacae".

Page 141, Table 27, 1st line, change "Superphylum" to "Superkingdom".

Page 145, 10th line from top, change "EUMACOTAE" to "EUMYCOTAE".

Page 155, 26th line from top, place "Lectures, 1961-62" at the end of the line beginning "Lees, H. etc."

Page 162, 20th line from top, change "Mauterpuis" to "Maupertuis"

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AMARYLLIS
YEAR BOOK

1969

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Amaryllis aulica stenopetala

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PLANT LIFE, VOL. 25, NO. 1, January, 1969

AMARYLLIS
YEAR BOOK
1969

Year Book of
The American Amaryllis Society
36th Issue

GENERAL AMARYLLID EDITION

EDITED BY
HAMILTON P. TRAUB
HAROLD N. MOLDENKE

THE AMERICAN PLANT LIFE SOCIETY
Box 150, La Jolla, California 92037

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[THE AMERICAN AMARYLLIS SOCIETY—continued on page 168.]

PREFACE

The cover design by Prof. Penrith B. Goff, of Wayne State University, Detroit, Michigan, represents *Amaryllis aulica stenopetala* as grown and photographed by Sam Caldwell in Tennessee from bulbs imported by Robert D. Goedert from South America. Prof. Goff is to be congratulated again on another beautiful cover design.

This 36th issue of the AMARYLLIS YEAR BOOK is dedicated to William Quinn Buck who received the WILLIAM HERBERT MEDAL for 1969 in recognition of his outstanding contributions toward the advancement of the amaryllids, particularly pioneer work with tetraploid daylilies (*Hemerocallis washingtonia*), and work with various other amaryllids. Mr. Buck contributes an autobiography and a report on *Hemerocallis* to the present issue.

Dr. Martin Cardenas, the recipient of the 1967 WILLIAM HERBERT MEDAL, has named a new Bolivian *Amaryllis* species, *A. escobaruriae* in honor of the La Paz Burgomaster, General Armando Escobar Uria, who staged the first flower show in La Paz in 1968. The members of the Society congratulate General Escobar Uria and Bolivia on its first flower show.

In the present edition, papers on exploration for amaryllids in South America are contributed by Dr. Ruppel and J. L. Doran.

Articles on *Amaryllis* are contributed by Fred J. Buchmann, Russell H. Manning, V. Roger Fesmire, Joseph K. Mertzweiller, J. T. Schmidt, Mr. and Mrs. Alek Korsakoff and Mrs. Fred Tebben.

Prof. Pedro F. Ravenna reports on new species of *Phaedranassa, Griffinia, Amaryllis* and *Nothoscordum,* including some excellent illustrations.

Dr. Easterly reports on the chromosome number in *Lycoris* ''cinnabarina'', and hardiness of some *Lycoris* species in Ohio, and Miss Grapes writes about the hardiness of some *Lycoris* species in western Nebraska.

Dr. John M. Cage reports on his *Sprekelia-Habranthus* hybrid, and also on the uses of some systemic pesticides with amaryllids. Mr. Hudson writes about the blooming of the Blue Amaryllis in South Carolina, and Miss Grier reports on the culture of *Narcissus* in southern California.

Mr. Tisch writes about his experiences with amaryllids in California, and on the naturalizing of plants. Prof. Davis details the handling of *Brunsvigia* x *parkeri* in Louisiana. L. S. Hannibal writes about various crinums and *Crinum* hybrids.

We are again indebted to Mr. Goedert for his annual report on the Amaryllis Season.

Mr. Van Woesik writes about his trip through the United States, and on the planting, fertilizing and caring for *Amaryllis* grown outdoors.

Dr. Artyushenko contributes a fine grouping of the *Galanthus* species, and Profs. van der Merwe and Grobler report on an electric drying press for herbarium specimens.

Mr. Russell H. Manning writes about sending live amaryllid flowers by mail.

Our good friend, Alek Korsakoff, the amaryllid enthusiast, contributes a most interesting autobiography that all members will enjoy reading.

There are also reports on the annual Amaryllis shows, and various other items as shown in the table of contents.

Contributors to the 1970 issue of the AMARYLLIS YEAR BOOK are requested to send in their articles by August 1, 1969, in order to insure earlier publication of this edition. Unless articles are received on time, publication will again be delayed to June or July or even later as with some issues in the past. Your cooperation toward earlier publication will be greatly appreciated. Those having color slides or transparencies which they wish to use as the basis of illustrations, are requested to have black-and-white prints made, and to submit these with their articles.

December 15, 1968
5804 Camino de la Costa,
La Jolla, California 92037

Hamilton P. Traub
Harold N. Moldenke

PLANT LIFE LIBRARY—continued from page 167.

DICTIONARY OF ECONOMIC PLANTS, by J. C. Th. Uphof. 2nd Edition. Verlag von Cramer. Sold in the U.S.A. by Stechert-Hafner, 31 E. 10th St., New York, N. Y. 10003. 1968. Pp. 591. This second, revised and enlarged edition of an important reference book on economic plants will be welcomed. In the new edition over 3000 species have been added so that the total number of entries is now 9500. The subject matter, excepting ornamental plants, includes those important in agriculture, forestry, pomology, olericulture, pharmacognosy, and crops producing oils, rubber, spices, essential oils, gums, resins, etc. The entries are arranged alphabetically. The bibliography has been more than doubled. Recommended to all interested in economic plants.

THE MEANING OF EVOLUTION, by George Gaylord Simpson. 2nd Revised Edition. Yale University Press, New Haven, Conn. 1967. Pp. xvii + 368. Illus. cloth, $7.50; paper, $2.45. Subtitled "A Study of the History of Life and of Its Significance for Man", this revised edition of a stimulating book by an outstanding authority, will be welcomed. This easy to read explanation of the evolutionary process is arranged under four sections—prologue, the course of evolution, the interpretation of evolution, and evolution, humanity and ethics. Highly recommended to the specialist, student and the general reader.

READINGS FROM SCIENTIFIC AMERICAN: BIO-ORGANIC CHEMISTRY, with an introduction by Garrett Hardin. W. H. Freeman & Co., 660 Market St., San Francisco, Calif. 94104. 1968. Pp. 317. Illus. $4.95. The 32 articles by various authorities, published in the Scientific American, have been selected on the basis of "chemical emphasis, significance, novelty and the level of presentation" to close the gap between the classically oriented elementary organic textbook and the detailed biochemical treatise. The three sections of the book are (1) macromolecular architecture, (2) Biological Regulators, and (3) chemical biodynamics. This stimulating text is highly recommended to all interested in recent developments in bio-organic chemistry.

PLANT LIFE LIBRARY—continued on page 54.

Dedicated to
William Quinn Buck

HERBERT MEDALIST—WILLIAM QUINN BUCK

WILLIAM QUINN BUCK

AN AUTOBIOGRAPHY

I was born on April 27, 1908, in Chillicothe, Hardeman County, Texas, where my father published a weekly newspaper. My earliest recollections of plants are of the delightful smell of the peach trees that had come up between the printing office and a big frame building which I think was a livery stable. A little old lady living near the blacksmith shop had a garden so full of plants that no more could have been crowded in, and the garden was almost as fascinating as the blacksmiths' work.

My seventh birthday came while we were visiting my parents' families in Mississippi, and it was there that I got to see the big shrubs from which my grandmother picked the fragrant Cape jasmines that she tried to send by mail each year. The japonica, with its shiny leaves and small red flowers, was so much the center of my interest that severe punishment rewarded my picking the flowers. The green rose was the real marvel of the garden though, and it probably excited my keenest delight.

About the time I was in the third grade we moved to a new home which had a very large garden area, and I immediately began gardening. Learning how to germinate snapdragon seed in spite of the dry West Texas air by shading the seed box with wet sacks, and growing water-lilies for tubs from Burpee seed were among my fondest youthful horticultural accomplishments.

By the time that I went away to Clarendon College in 1925 there was a huge collection of gladiolus corms and dahlia roots that had to be dug, cured, and stored, and of course my mother was the only one to assume the responsibility. Summer gardening thereafter had to be curtailed in many ways.

Study of painting was begun at Clarendon and later continued at Texas Christian University, in Fort Worth, from which I was graduated *summa cum laude* in 1929, with majors in English and art. In the fall of that year I went up to Philadelphia to enter the Pennsylvania Academy of the Fine Arts, oldest art school in the country. In 1930 I was admitted to classes at the Barnes Foundation in Merion, Pa., and I heard the first brief series of horticultural lectures there.

In December of 1929 I got a night job in the proofreading depart-partment of The Philadelphia Inquirer. By 1931 classes at the Academy had to be dropped for a year because of a serious illness. About this time myopia became a serious problem. In 1935 I enrolled in the graduate school of the University of Pennsylvania. During these years plant growing had to be limited to a few pots, but seedling

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agapanthuses and a clivia were managed somehow. Frequent visits to Horticultural Hall, the Morris Arboretum, and the University of Pennsylvania botanical garden, and the annual flower shows, gave me plants to see, at least.

In 1937 I suddenly began to have tiny hemorrhages on both retinas, and this hemorrhagic choroiditis and a detached retina in the right eye soon forced me to leave the proof reading job and give up painting permanently. A return to growing plants now became logical. It was during these trying years that I first became interested in the *Hemerocallis* and hybridizing, as well as in using colchicine as a polyploidizing agent. My daylilies had to be grown on a hillside near a spring on the land of a friend in Bucks County, and I lived in the old stone farmhouse at the top of the hill the summer that I had braille lessons.

A couple of trips to Florida and Southern Georgia failed to enable me to become located in a warmer climate, as advised by the oculists. After trying south Texas, also, I arrived in California early in 1942. For a year I worked for Cecil Houdyshel, the bulb grower, in La Verne, and then I went to the University of California at Los Angeles, becoming a senior laboratory technician at the greenhouses in the floriculture department. I was able to do a considerable amount of daylily and amaryllid work here. The polyploidizing experiments were resumed, and in 1948 the first of my induced tetraploid daylily clones flowered. Colchicine was used successfully on germinating orchid seed in this period.

In 1950 I became head of the propagation section at the Los Angeles State and County Arboretum in Arcadia, and during the ensuing fifteen years some of the polyploidizing experiments were squeezed in with the propagation of thousands of plants from all parts of the world. A colchicine-induced tetraploid blue daisy, *Felicia amelloides* 'Santa Anita', obtained from 1951 experiments, later was given an A.M. by the California Horticultural Society and was commercially propagated by the thousands for use in the Los Angeles and San Francisco areas. By treating germinating seed from a fine diploid strain a whole series of wonderful *Gerbera* hybrids was obtained. *Lagerstroemia indica,* the Crepe-Myrtle; *Chorisia speciosa, Tabebuia chrysotricha, Ligustrum japonicum, Fatsia japonica* were among the plants treated in extensive colchicine experiments. A fine collection of amaryllids was brought together here, and some wonderful hybrid amaryllis seedlings were grown, including the *Amaryllis calyptrata* hybrids.

Since my retirement in 1965, the work of polyploidizing and breeding daylilies, amaryllises, and orchids at home has been given all my time. My acre lot has long been filled, and good neighbors are letting me grow seedlings on their ground, and my 18′x60′ greenhouse contains enough plants to fill several. 1968 saw unusually good results with the daylilies, and the improvements in polyploidizing techniques worked out will give even more rapid advancement in coming years, we hope.

1968 HEMEROCALLIS REPORT

W. Quinn Buck, *Chairman, Daylily Committee,*
American Plant Life Society

The 1968 season emphasized strongly the importance of having established clumps for breeding daylilies, as well as showing the old problems of regional adaptability. Rather consistently the tetraploid clones from Dr. Traub set seed well on the established clumps and poorly on first-year plants. This year the clones from Dr. Peck bloomed beautifully but again proved poor parents, demonstrating that something still was not to their liking in our soil or climate.

The 1967 introductions from Brother Charles also showed the need for being better established. 'Loyal Subject' was almost an exception to this appraisal, doing best of all of them, and it did so much better in Bakersfield, in number of spikes and in number of pods set, that it raises the strong possibility that low night temperatures here might be to blame. Of the Fay varieties 'Mary Todd' set pods fairly well, and it was a beautiful flower, but it was not sunfast here. 'Golden Surrey' had no fringe on its first flowers, but on the redbloom spike when nights were warmer the fringe was there. Older clumps of Fay tetraploids were good seed parents, with the exception of 'Crestwood Lucy' and 'Crestwood Ann'. Each year 'Crestwood Lucy' will set a few pods here, but 'Crestwood Ann' will set none at all.

'Fair Annet' (Peck) and 'Bonnie Barbara Allen' (Peck) this year were quite beautiful in pink effect in the garden. 'Sir Patrick Spens' (Peck) had the best color of any red tetraploid yet seen, and it seemed almost as sunfast as the old reliable 'Bess Ross' (Claar) in our area. 'Fair Margaret' (Peck) and 'Queen Eleanor' (Peck) were melons of fine form.

Among the newer diploids 'Prairie Moonlight' (Marsh) was particularly outstanding as an established clump, and here it was not rivaled even by the wonderful creamy yellow 'Crystal Sunshine' (Bro. Charles). 'Prairie Melody' (Marsh) again this year was an especially beautiful pink. In the bright lavenders, 'Charlemagne' (Moldovan) had great color appeal, but it may be somewhat lacking in sunfastness in our area. 'Childscraft' (Childs) was most outstanding in both quality and form.

Among the miniature melons 'Little Rainbow', 'Toyland', and 'Cub Scout', all three from Bro. Charles, performed well. 'Little Darling' (Spalding), much branded, and 'Dreamlet' (Childs) were good pink miniatures. 'Little Wart' and 'Wanetta' from Miss Spalding have to stay as favorite lavender-purple miniatures that everybody should grow.

In the Buck garden the results from using treated plants were unusually good, and the clones offering greatest promise included 'Beauty Pageant' (Fay), 'Superfine' (Fay), 'Jewel Case' (Lester), 'Porcelain Dole' (Lester), 'Good Evening' (Wynne), 'Best of Luck' (Wynne), 'Eburnean' (Munson), 'Diamond Anniversary' (Childs), 'Childscraft' (Childs), 'Little Darling' (Spalding), and the beautifully colored

'Raspberry Frills' (Williamson). Many very fine combinations were obtained.

One of the outstanding events of the year was the publication of the *Daylily Handbook* by The American Hemerocallis Society and the American Horticultural Society, as a joint project. This *Handbook* is a most important new working tool for those interested in the *Hemerocallis.*

Fig. 1a. Henry van Woesik, President-Director, Ludwig & Co., in his business office.

TWO MONTHS' AMARYLLIS TRIP IN THE U. S. A.

Henry van Woesik, *President-Director*
Ludwig & Co., P. O. Box 18, Hillegom, Holland

GROWING AMARYLLIS IN THE OPEN

To study the matter on the spot I decided to visit with all the centers where Amaryllis are grown in the open on a fairly large scale, for which it is obviously too cold in Holland, where these semi-tropical bulbous plants only do well in hothouses equipped with a special heating system, so that even the soil has the ideal temperature.

I started my U. S. Amaryllis trip and lecture tour in Houston, Texas on May 12th 1968, subsequently calling at Corpus Christi, San Antonio, Austin, Beaumont, Baton Rouge, New Orleans, Hattiesburg, Mobile, Chickasaw, Panama City, Tampa, Sarasota, Fort Myers, Miami, Orlando, Jacksonville, Valdosta, Griffin, Greenwood, and Atlanta, after which I went northward, where Amaryllis are grown in much the same way as in Holland. A death in my family prevented me from finding time to see Amaryllis growing in California, Arizona and Oklahoma, which States I intend to visit in 1970.

Of course, I saw no end of Amaryllis grown in yards and gardens, but as some people easily bruise, I may not have been over-anxious to point out the mistakes made.

Let me first mention the positive side of the Amaryllis world in the States I visited:

THE POSITIVE SIDE

(a) The enthusiasm with which Amaryllis-fans grow Amaryllis in the open is overwhelming.

(b) Both men and women have green thumbs, by which I mean that they are ready to work for long hours to get the best results. In my opinion a nurseryman or woman with green thumbs is one that does not balk at working 14 hours a day.

(c) The Amaryllis-groups are found in almost any city and are well organized in Amaryllis Clubs or Garden Clubs and each member is supposed to do his or her share of work to rouse and stimulate interest in Amaryllis.

(d) They organize Amaryllis spring shows, where the most outstanding Amaryllis flowers are a treat to the eyes of the public at large, which cannot but popularize the Queen of Flowers.

(e) Growing methods are conscientiously studied at their monthly meetings, which is bound to improve them in the long run.

(f) At shows there is a fair competition for prizes, though this does not degenerate into prize-hunting, for participating is more important than winning prizes.

(g) They do everything to have people who are experts, speak at their meetings, resulting in lively and highly interesting discussions.

(h) Temperature in all the cities I visited was ideal to grow Amaryllis in the open, but though my fuel-bill is a regular nightmare here in Holland, there are also a good many disadvantages and drawbacks when Amaryllis are grown in the open, which I cannot help mentioning.

THE NEGATIVE SIDE

(a) Amaryllis-lovers are so enthusiastic that they refuse to remove Amaryllis that obviously suffer from Mozaic-virus. I was often impressed that some people did not know what Mozaic-virus was, in which case I explained the term and the phenomena to them, for Mozaic-virus can be detected easily enough by examining the foliage.

The worst of it is that the disease spreads like wild fire; there is a legend that one virus plant infests the other, but as legends are meant for the superstitious, I do not believe them and I am convinced that when an Amaryllis plant has contracted virus, the disease is spread by insects sucking juice from the foliage of a virus infested plant, then flying to another healthy plant, sucking its juice and spreading the disease in this way. Secondly the virus infested plant may contaminate the soil, so that future Amaryllis planted in the same spot may again be infested, for which reason we sterilize the soil in our hothouses every year before planting the bulbs.

Finally the virus will develop to such a degree that the foliage turns yellow with green spots, affecting also the flowers, so that it is not true what a good many Amaryllis-lovers assert that virus infested Amaryllis produce perfect and normal flowers.

(b) Though American Amaryllis-lovers do not grudge work, they should have their soil inspected by the American Plant Inspectors, when the results are not satisfactory.

They spend a good deal on fertilizing, which is no good; if they do not know what is wrong with the soil, any attempt to remedy it, will be a leap in the dark, unless they know the composition of the soil.

I have found in the States I visited, i.e. Texas, Louisiana, Alabama, Mississippi, Florida, Georgia, North and South Carolina, that generally speaking the pH (degree of acidity) of the soil is far too high (from 8 to 12), which should be reduced to somewhere between 6 and 7.

The alkalinity of the water in these States is also of great consequence, but if watering is done after 4 PM, the damage will be less than when one waters during the hottest part of the day, i.e. between 10 AM and 4 PM.

(c) The Amaryllis and Garden Clubs should bring home to their members that selfcrosses or ''selves'' lead inevitably to inbreeding, which is against nature, causing degeneration in the long run. Never cross one bulb of a variety with the pollen of another (or of the same bulb for that matter) bulb of the same variety.

(d) Amaryllis flowers for shows are always grown best in greenhouses, where watering is under control and where insects can easily be killed by spraying the plants with some disinfectant, which will prevent them from catching all kinds of diseases.

In principle I should be in favor of killing off as many insects as possible also in the open. Of course, if one's neighbor does not spray, it is of little avail, but nowadays everybody is struggling with insects, so why not do a thorough job, starting in the yard or garden?

(e) With the aid of several American Amaryllis growers who know their job I have drawn up planting and fertilizing directions. These are given in detail in another section of the present AMARYLLIS YEAR BOOK.

(f) Amaryllis shows are meant to popularize Amaryllis with the public at large; keen, but fair competition is all right, but prize-hunting with unfair means will kill the enthusiasm in the local Amaryllis and Garden Clubs.

(g) Temperature in the open cannot be controlled, but the preparation of the beds could be done in accordance with the Planting and Fertilizing Directions.

Some people in Houston, Corpus Christi, San Antonio and many other cities have managed to grow one and the same bulb successfully for more than 15 years. Of course, fertilizing is necessary in this case, for when the bulb has done flowering, it feels like a sponge and should be restored to normal size, but if the soil of the bed is nutritious and has the correct pH, half the work is already done.

(h) Many Dutch bulbs start sweating in transit, due to a sudden change in temperature; they sometimes lose their roots and show reddish and brownish spots, called Red Neck disease or technically Stagonosphora.

Delay in delivery from the American port of entry to destination seems to be inevitable in some cases, though I am sure that such delays could be avoided when shipping agents were somewhat more conscientious, but the disease can easily be cured; on arrival the bulbs should be thoroughly cleaned, or rubbed clean with sand; and then applying Dura Dust (50% D D T) and putting them aside in a cool place for about 48 hours and letting them dry before planting. One New Orleans customer told me that bulbs suffering from Red Neck disease had been thoroughly cleaned by him, after which he put them under the water tap, washing away what little rot was left, drying them thoroughly before planting them, and his success was enormous.

I was glad to find that a good many people grew Amaryllis successfully, as they had found out most of these things themselves. I have admired beautiful lots of Amaryllis, entirely virus-free all over the States I visited, and I was really thrilled to find a married couple in Valdosta, Georgia, having thrown more than 4,000 Amaryllis on the scrapheap, turning over a new leaf, when they noticed that the bulbs were infested with Mozaic-virus; of course, they should have selected the lot a few years earlier, in which case they might have saved a fair percentage of the bulbs, but then it takes courage to admit a mistake and to take the necessary measures to correct it, especially if such measures cause a substantial loss of precious Amaryllis.

(i) When visiting Florida, I was welcomed by a hurricane (''Abbie''), and one day there was 15″ rain, which spelled ruin to a good many plants and bulbs including Amaryllis.

Heavy showers and torrents are nothing out of the common in areas where Amaryllis can be grown in the open; drainage is generally very poor. Why not plant the Amaryllis in beds, the tops of which are brought 4″ above the surrounding garden areas, so that there is sufficient drainage?

(j) I happened to spot aphis or aphids (plantlice or greenfly) in the yard of a well-known Florida Amaryllis grower, who was evidently not much impressed when I drew his attention to this danger. I may point out to you here that aphis is very stubborn, once it has spread. Any insecticide will kill aphids, but then they have generally already laid eggs, which are not destroyed by spraying, so that the treatment should be repeated at least three times with a week's interval. As soon as you discover a wooly stuff on the foliage or between the leaves, you may be sure there are aphids, so start spraying, for aphids multiply more rapidly than rabbits.

Prevention is better than cure; five weeks after planting our Amaryllis we start spraying them for the first time with Parathion to kill all insects, including aphids, and we repeat the treatment four or five times with a fortnight's interval.

I know that in some areas in the U. S. A. you may not use Parathion *which is indeed very poisonous,* but then your dealer will know of an adequate substitute for Parathion.

Considering everything I am fairly optimistic as to successful Amaryllis growing in the open in the U. S. A. Mistakes are made, wherever work is done (and U. S. A. Amaryllis growers do a lot of work), whereas the average American Amaryllis-lover is eager to learn, so that his constant endeavors are bound to be attended with success.

A friend of mine in Corpus Christi expressed himself as follows: ''I hope to hear you say in three to five years that your Amaryllis shipments to the States have doubled. This I know can be done, for the surface has hardly been scratched so far''. Let us continue scratching the surface, for beauty, though a rare thing, can be created in your yard and garden with some effort and will give you much joy and satisfaction.

ALEK KORSAKOFF

AN AUTOBIOGRAPHY

Our venerable Editor, Dr. Hamilton P. Traub, asked me to write something that would ''do justice to (my) eventful and useful life.'' ''Eventful'' can be accepted, but ''useful'' is debatable.

My Odyssey (or would it be better to call it a Saga?—There may be a drop or two of Viking blood in my veins), if indulged in to the limit, would fill much more than one issue of the Yearbook.

CHILDHOOD, 1894—1910

As recorded officially, I was born twice—Febr. 17, 1894 (Julian Calendar), and March 1, 1894 (Gregorian Calendar). I inhaled the then almost unpolluted air in Porohovaia Sloboda, a suburb of the City of Kazan, on the Volga River. There I spent all my time until 1913. My native town is located several miles from Kazan, and included then the military post guarding the Porohovoi Zavod (Gunpowder Plant) and housing facilities for thousands of employees, including my father. Primeaval forests surrounded it and the Powder Works.

In 1903, at the age of 9, I entered grammar school; finishing it in 1906. I then attended the City School, somewhat equivalent to Junior High School. My father had passed away, and mother was not able to enforce my taking French and German (languages being elective). In 1910, I graduated, second in the class minus languages. ''The elbow is very close but try and bite it.''

CALM BEFORE THE STORM, 1910—1915

I was first employed as a messenger boy in the Powder Plant and shortly after moved to the Plant Chemical Laboratory. When my eyes started bothering me, the doctor advised me to quit the Laboratory. With the recommendations of the Plant officials, I entered the provincial branch of the Church Synod with the first rank of a Civil Service Officer. I did not like the gloomy office and church squabbles and decided to be a Medical Doctor (M. D.) Having insufficient education to enter University, from the ''front'', I laid plans to storm it from the ''rear''. Obtaining tutoring in Latin, I passed the examinations, and was ready for a pharmaceutical ladder to doctorship.

The time came when I must leave my forest and floodlands of the Volga—flower gathering in spring time for the market; gathering mushrooms in summer for mother's lay-a-way; nutting in the fall (the best nuts being stolen from the squirrels); fishing in the Volga for sterlet and carp in forest lakes; catching birds in winter. . . .

I can never forget my first and only flight so far. Carefully placed crow's eggs in my pocket, I started down from the nest and went faster than planned—there I was hanging by what was left of my pants, about 12 feet from the ground on a stub of a broken limb. I have had no recollection of the passage of about 30 feet between the nest and the saving stub, then or have now. However, I came down whole excepting for the pants. Don't ask about the eggs.

No more winter skiing over the woods and fields, tracking foxes, snaring hares, meeting moose; no more bringing home in early spring wild roses, Mountain Ash, Weeping Birch to plant alongside Mother's lilacs, raspberries, gooseberries, etc. No more expecting another winter when sparrows, flying from under eaves, would fall frozen; or one with a warm spell that would gloss everything during rain around Christmas time.

In 1913, I found myself in northern Caucasus on the shores of the Kuban River as an apprentice pharmacist in a drug store. The vegetation was different; fishing was different. All else was different—peach and apricot orchards acre after acre; miles upon miles of sunflower fields harboring wolves; grapes and wine, and no woods at all.

Two years passed, I was back in Kazan to enter the University with courses leading to assistant pharmacist's grade on the ''ladder''.

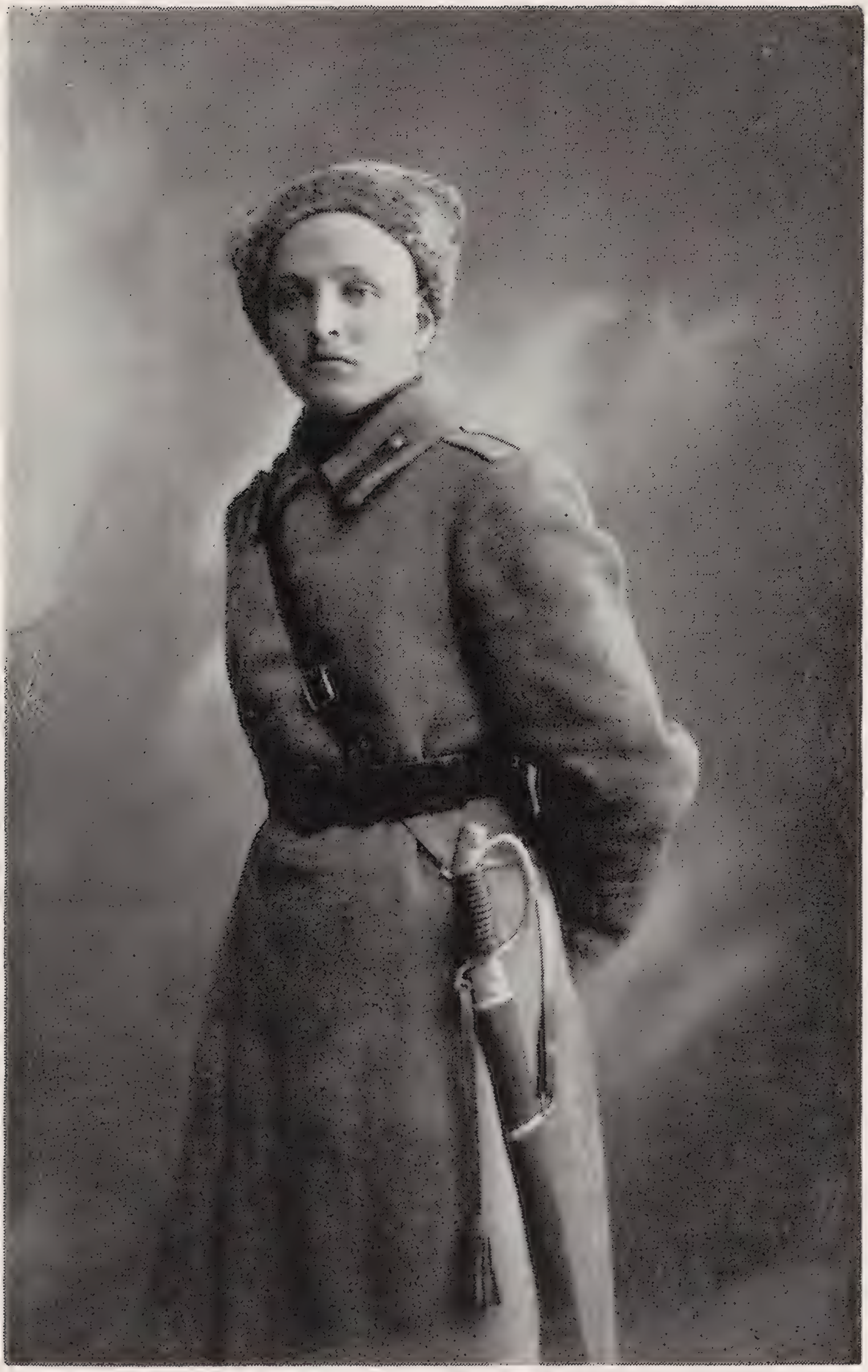

Fig. 2. Aleksey Stepanovich Sosipatrov-Kuznetzov (later John Karl Johnson and Alek Korsakoff) in the field uniform of the Russian Imperial Army before 1917.

THE STORM, 1915—1920

Mobilization! September 8, 1915, in the Army! By September 12th in Samara in the 102nd Reserve Infantry. March of 1916 found me in the Military School, the same one that allowed my Sokal Athletic Club the use of its gymnasium. June 15, 1916, I was commissioned an Ensign in the Russian Imperial Army. I was left in the school as assistant instructor for the next class. In October, I was ordered to the Noncom School of the 164th Reserve Infantry. Back in my woods again! There the Revolution caught up with me. The day the regiment mutinied every single officer fled the Regiment environs except myself. I was trapped in the barracks of the school.

Before the actual revolt in my regiment, all live ammunition was brought to the school. The fact being that no one likes noncoms, my charges were as badly off as myself. We decided to stay put and let it be known that any one appearing in the open space around our barracks would be shot on sight. We posted sentries at every door and window, and waited to see what would happen next. Night came bright, the snow was white, and there was no attempt to set our barracks on fire.

Morning came, everything was quiet. About noon, every one who did not desert elsewhere got hungry. The quartermaster in the City refused to issue anything without requisitions signed by a commissioned officer. There was a meeting with the result that I was a Regimental Commander for two whole days!

By September 1917, I was in the trenches at the front in Poland, a member of the 30th Siberian Sharpshooters Regiment. To break the trench monotony in October, I volunteered for the Strike Battalion of Death of the 8th Siberian Sharpshooters Division. Once I was slightly gassed, once I had a bullet make a hole in my hat; another time one passed through my coat. Many ''pinged'' around my head but the only scratch I acquired was when I fell head first, one dark night, in a trench.

Attaining by that time the rank of Staff Captain, I and my orderly, I in disguise, deserted December 2nd, 1917. He went home, I planned by some chance to get to France and the Russian forces still fighting there. On the 10th of December, my sister being dead, I bid my mother Good Bye . . . for the last time.

In Siberia, I got in a scrap with the train commissar. He stopped the train, a kangaroo court was set to try me—the proposed punishment, putting me under the train, was about to be accepted when my orderly, a real ''dyed in the wool'' Sibiriak (Siberian) started talking. A new commissar was chosen and the train chugged on. My orderly begged me to go to his father's farm. Time came for him to change trains, we parted. . . .

On the 31st of December, I was in Harbin, Manchuria, and at the U. S. Consulate was refused crossing America on the way to France. There was no work to be found, and I had plenty of time to visit all parks, cemeteries, and City nursery, which were well provided with vegetation, all new to me. When my money was dangerously low, I had only three or four decent meals in a week. Fortune smiled on me on April 17, 1918. I was employed as a Laborant in the Pharmaceutical Department of the Chinese Eastern Railway's hospital. Fall found me as a YMCA Physical Director in one of the High Schools. My first contact with America.

Fig. 3. John Karl Johnson (born Aleksey Stepanovich Sosipatrov-Kuznetzov) in the U. S. Army, 1920-1921, Manila, Philippine Islands.

In March 1919, Kolchak arrived, and I was in the Army again. When the Allies came to Siberia, I was assigned as a liaison officer to an American detachment guarding a stretch of the Far Eastern Railroad. When on patrols, I paid more attention to vegetation than anything else, although one time crossing a creek, the lieutenant in charge, and myself found gold flakes in the sand.

FROM MANILA TO AMERICA, 1920—1922

On February 15, 1920, Co. E. 31st Infantry, packed me in the hull of the S. S. Great Northern, and on the 24th I arrived in Manila.

In a few days, the F. B. I. was scouring town for a Russian; on March 18th, a native son from the ''Windy City'', named John Karl Johnson, became Pvt. of Co. E. 31st Infantry, U.S.A., and there was no Russian ''any more.''

Everywhere were tropical trees, shrubs, vines, flowers; and sugar cane, and tomatoes. All the fruits. Days, weeks, two years roaming the environs of Manila in the bamboo forests watching iguanas, in 10 to 12 feet deep cool and moist gullies full of Java sparrows and some of the tiniest birds flitting around. The king of all fruits, the Mango by the bushel.

At the end of 1920, John Karl Johnson decided that he had picked up enough English to be able to stand on his own two hind ''laigs'', and after a trip to Peking, China, to enjoy the swallow nests, and best ever glazed sweet potatoes, he left his Co. E friends. On January 20, 1921, he became a pharmacist in the Sternberg General Hospital dispensary in Manila, but just for a few days. Soon he found himself in the hospital medical supply room, where the Sarge in charge in a few months left the inventory in almost his sole hands.

THE HAVEN OR ''HOME'' AT LAST—1922 TO PRESENT TIME

In March 1922, the ''native son'' left the oleanders, and Night-blooming Jasmine, *Cestrum nocturnum*, in full bloom and started ''back'' to the good old U. S. A. and Chicago. Hawaii passed by, and by April 3, John K. was on the Angel Island in San Francisco Bay surrounded by giant Eucalyptus trees, and the most virulent poison ivy, gazing on beautiful Alcatraz. After April 29, my home, sweet home was Camp Lewis for the rest of my army life. There, as a Room Orderly, I had the most enjoyable days roaming the surrounding woods, berrying in time, appling in time in abandoned orchards; flushing pheasants. . . .

I was discharged on March 16, 1923, naturalized on the 26th. The judge, after hearing my name, Aleksey Stepanovich Sosipatrov-Kuznetzov, said: ''Sayitagain.'' I did. Said he, ''with a name like that, you will have no chance at all.'' ''Think of something simple and short,'' he continued. Said I, ''Aleksey Stepanovich Korsakoff, the last name of my uncle.'' Well, the musician, all right; but let's drop the ''Stepanovich'' and cut off ''sey'' from ''Aleksey'', was his come-back. So Alek Korsakoff was born; but not smart Alec, but Alek. This is the fifth and final name that I have been masquerading under since leaving my childhood home in Russia.

First I worked for construction and lumber companies, and then in October joined the American Legion, and entered the College of Forestry, University of Washington in Seattle on probation due to no papers of previous schooling. However, at the end of the second quarter, it was agreed that seven years in Russian schools was sufficient, and I became a regular student.

Then followed work in the Forest Service, in the Rainier National Forest in summer, and afterwards Malmo Nurseries in Seattle. About this time the marital troubles of my aunt's adopted daughter, Elena Korsakova, and my childhood playmate, came to a climax. She was divorced. My mother was dead, and she was the only link with the childhood days. ''Want to marry me? This is the only way I can bring you to America.'' ''I will'' was the reply. No more college for me.

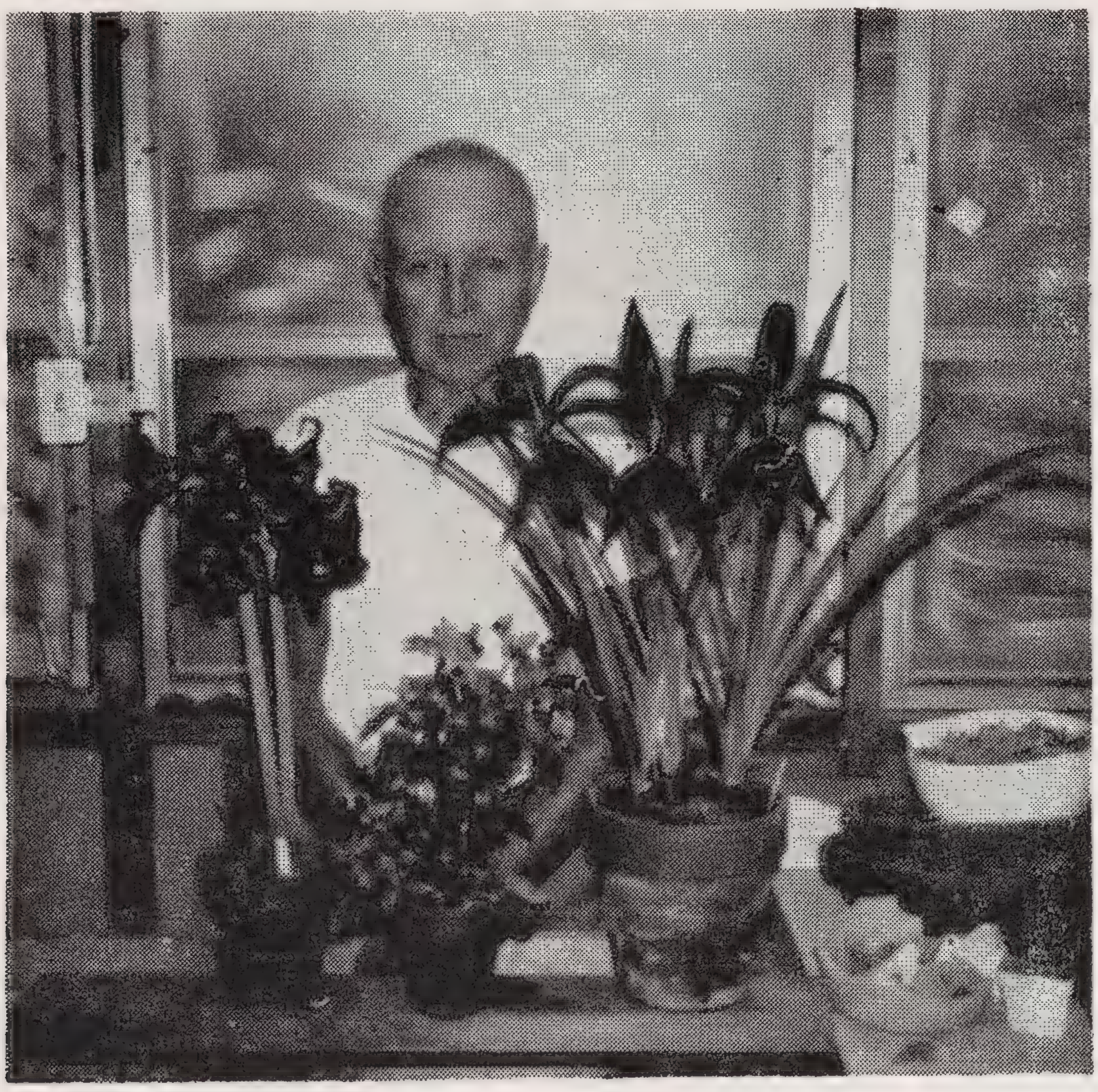

Fig. 4. Alek Korsakoff (born Aleksey Stepanovich Sosipatrov-Kuznetzov), the amaryllid enthusiast, among some of his favorites in Florida.

Closer to the Atlantic. In October of 1925 I worked for the Carolina Flower Store, Charleston, S. C., then Washington, D. C., and passport, visas and New York in December. Bronx and the New York Botanical Garden, Central Park and the Zoo.

On January 20, 1926, I was married and had a fine four-year son in the bargain. Barely enough money for the honeymoon—Germany, Holland, France, Spain, Cuba.

On June 7, we were in Miami. In a few days my wife started working as a dishwasher in a restuarant on June 14, temporarily until we got settled; on June 14th I was employed in the City Nursery. In July 1927, I was practically in full charge of the Miami City Cemetery as a caretaker. The Cemetery Sexton was in charge of the Bayfront Park, and spent his time there. Later, I became the Sexton and stayed there until retirement in 1962.

During my time the 10 acres of Cemetery grounds became a Botanical attraction, second in Miami only to Chapman Field, the Government Plant Introduction Station. Botanists visited the Cemetery, the College of Forestry, University of Miami, used it for field studies. Dr. Small's (N. Y. Botanical Garden) seed of *Platanus orientalis,* collected in Manhattan, grew well, and Dr. Small never missed a visit when in the vicinity. Dr. Fairchild and I exchanged visits, he to the Cemetery, and I to the Campong, his home. Then the Fairchild Tropical Garden was founded, and the Cemetery was forgotten.

During the late twenties and early thirties, a group known among themselves as Floragoofs often met and had discussions and arguments. Participating were Dr. Swingle, Sr., Dr. Buswell, Dr. Alexander; sometimes they were joined by Dr. Gifford and Mr. Johnny Lynch. The botanists had the interest and the knowledge, I had interest also, ten acres to plant in, unabated desire to watch development and always ready to report. As time passed and many of the Floragoofs passed on to better hunting grounds, my interest in trees, shrubs and vines diminished. The Cemetery was full of maturing and even aging plants, but in the yard there was ample room under the two Avocados, a Rose Apple tree, an Egg Fruit tree, a Sugar Apple and the Sour Sap. By and by my interest turned to smaller things—succulents and a few cacti, then Bromeliads, and Lo! *Amaryllids.*

In 1956, Mrs. Clint sent me a dozen or so species of *Zephyranthes* collected in Texas and Mexico. Since then I am a Rain Lily Goof, or rather, a Zephfan. In addition to a few *Amaryllis* species and other amaryllids, there are also miniature Gingers and a few things in other families. I enjoy 24 accessions in *Habranthus,* species and hybrids; two *Pyrolirions,* two *Sydneyas,* 159 *Zephyranthes,* species and hybrids. These include at present more than 50 of my own crosses. God is good! Praise be to Him!

After naturalization, my wife ''Ellen'' died in 1962. After 36 happy years, I was left alone. Her boy, my adopted son, is married and lives in New Jersey. Now I had only my plants to worry about, I retired. Later, through correspondence dealing with Amaryllids, I got acquainted with my present wife, Mrs. Meta M. Samples and we were married in 1964. I am afraid she is more a Floragoof than I. Her present interests are *Amaryllis* species and hybrids, Amaryllids and Orchid Cacti. So we have our squabbles. Our 18′x60′ greenhouse is divided. I rule one half, she the other. The other smaller one is wholly hers. She rules the yard with beds of *Amaryllis, Lycoris,* Rhodophialas and what not. God is good! Praise be to Him.

HERBERT MEDAL PRESENTATION TO DR. ROBERT P. KAHN

In a ceremony at the annual dinner of the Potomac Branch of the American Phytopathological Society, Dr. Wilbur D. McClellan, Assistant Director of the Crops Research Division, Agricultural Research Service, U. S. Department of Agriculture, presented the 1968 WILLIAM HERBERT MEDAL to Dr. Robert P. Kahn, March 27, 1968, on behalf of the American Plant Life Society (Fig. 6.).

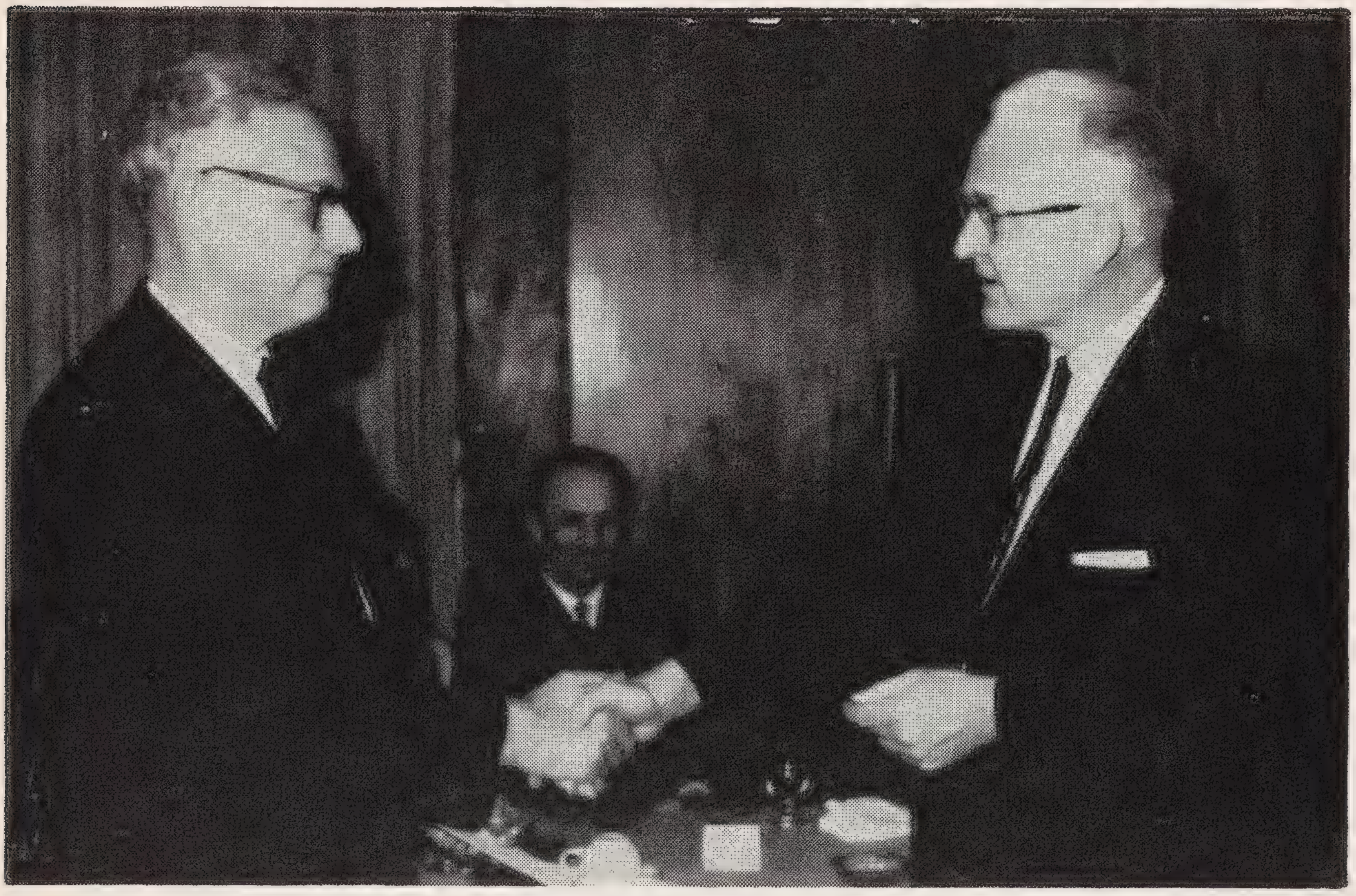

Fig. 6. Dr. Robert P. Kahn (left), virologist of the Plant Quarantine Division, A. R. S., U. S. D. A., receiving the 1968 William Herbert Medal from Dr. Wilbur D. McClellan, Assistant Director of the Crops Research Division, A. R. S., U. S. D. A., on behalf of The American Plant Life Society.

EDITOR'S MAIL BAG

Mrs. Marei Splinter (Mrs. A. C. Splinter), Zelgliweg, Maniken, Zurich, Switzerland, writes under date of June 23, 1968, that her husband, A. C. Splinter passed away a year ago, and that he kept up his interest in the amaryllids to the end. His many friends in the United States will greatly miss him.

EDITOR'S MAIL BAG—continued on page 32.

1. REGIONAL ACTIVITY AND EXHIBITIONS

THE 1968 OFFICIAL AMARYLLIS SHOWS

The Amaryllis shows began on April 6—7 with the Official Men's Amaryllis Club of New Orleans Show with horticulture exhibits; including arrangements exhibits sponsored by the Garden Circle Amaryllis Club of New Orleans. Then followed the Official Houston Amaryllis Society Show, on April 20; the First Official Amaryllis Show sponsored by the Amaryllis Society of Baton Rouge, Louisiana, on April 21; the Official Coastal Bend Amaryllis Society Show, on April 27—28; the Official Amaryllis Show sponsored by the Amaryllis and Hemerocallis Society of Southern California, also on April 27—28; and the Official Greater Houston Amaryllis Show, on April 28.

The Official Hattiesburg (Miss.) Amaryllis Society Show had to be canceled due to inclement weather. The Hattiesburg members and the American Amaryllis Society mourn the death of Mrs. William H. Sparrow, who died on April 25, 1968. Mrs. Sparrow had been active in staging the local shows. No report has been received of any show at Mobile in 1968.

1968 OFFICIAL AMARYLLIS SHOW OF NEW ORLEANS

James E. Mahan, *3028 Palmyra Street,*
New Orleans, La. 70119

The Official Amaryllis Show of New Orleans was held on April 6 and 7, 1968 at the Edward Hynes School on Harrison Avenue and represented the combined efforts of the Men's Amaryllis Club of New Orleans, Inc. and the Garden Circle Amaryllis Club. The horticulture section was sponsored by the Men's Club and the artistic arrangements by the Garden Circle Club. This was the first time that these two clubs had joined forces to stage a very well received show.

In the artistic design division the Tri-color was won by Mrs. W. H. Lake, and in the creativity division Mrs. John A. Hennessey took the honors. Both presented very striking arrangements.

The horticulture section attracted many entries with the following trophies being awarded: Mrs. F. J. Cuquet, Sr., the W. R. Latapie trophy for the best registered, named specimen and also the Ludwig challenge cup; Mr. Lester L. Laine the Norman Clements trophy for the best un-named and unregistered specimen; and Mr. Milo C. Virgin the Reuter Seed Co. trophy, the James Mahan trophy, and the Swetman Amaryllis Garden trophy, all sweepstakes awards. American Plant Life Society Awards of Merit went to Mrs. E. J. Cuquet, Sr. and Mr. W. J. Perrin; Preliminary Commendation Awards to Messrs. Milo C. Virgin, Lester L. Laine and W. A. McCollum.

Good weather contributed toward a fine turnout in the way of show entrants as well as visitors, not only from New Orleans but from the surrounding areas as well. The numerous compliments from the visitors were very heart-warming and made all feel determined to put forth an even greater effort for the following year's show.

OFFICIAL HOUSTON AMARYLLIS SOCIETY SHOW, 1968

MRS. A. C. PICKARD, *Show Standards Chairman,*
1702 North Blvd., Houston, Texas 77006

The Houston Amaryllis Society Official Show staged under the standards of the American Amaryllis Society at the Garden Center in Houston, Texas, April 20, 1968 was a perfect fulfillment of the theme ''Amaryllis, Queen of the Spring''.

The consensus of the overflowing crowd was that an excellent Amaryllis show of garden grown specimens can be beautiful in spite of the abnormality of a cool spring.

One of the main attractions of the show was the Artistic Section in which the theme of the show was appropriately carried out.

The educational Exhibit on methods of propagation of Amaryllis included all stages of growth from seeds to the mature clone.

A special table on Conservation with informative information was well received.

The Junior Section received the Junior Achievement Award in the Educational Division as well as blue ribbons and trophies for cut Amaryllis specimens.

The Society has enjoyed a long span of productive years and its basic functions have remained constant. The ingredients which went into its foundation account for much of its accomplishments.

In the Horticulture Section the following received the highest A. M. and H. A. S. Trophies:

'Apple Blossom' (Lud.) cut Specimen, R.A.422 D.5.A.—A.M. Mrs. L. E. Morgan.

'Prince of Orange' (Warm.) cut Specimen R.A.506 D.5.A.—A.M. Mrs. Tracy T. Word.

'Bellina' (Lud.) pot plant R.A.856 D.5.A.—A.M. & Ludwig Challenge Cup. Mrs. L. E. Morgan.

Miniature (Lud.) 'Fire Fly' R.A.469 D.8.A.M.—Mrs. John Baird.

Breeders Class-Dutch Seedling P.C.—Dr. E. M. Yeats.

Breeders Class-American Seedling—P.C. Dr. E. M. Yeats.

Non-Competitive 'Doris Lilian' (Lud.) R.A.431 D.5.2.—Mrs. Leon Cox.

Non-Competitive - American Hybrid - non-registered D.9.—Mrs. Richard June.

Sweepstakes-awarded to H. A. S. Member—Mrs. Tracy T. Word.

AMARYLLIS SOCIETY OF BATON ROUGE OFFICIAL SHOW, 1968

FRED J. BUCHMANN, *Show Chairman,*
1766 Avondale Dr., Baton Rouge, La. 70808

The Amaryllis Society of Baton Rouge held its first official show on April 21, 1968. At this time of year, greenhouse plants have nearly finished blooming here and outdoors plants are nearing their peak bloom. This was in keeping with the philosophy that for a first show it would be better to have a reasonably large number of specimens including cut scapes from outdoors rather than a lesser number of potted, greenhouse plants. This objective was achieved in the competitive horticulture sections with a total of about 140 scapes having at least three florets, about 50 of which were potted plants. Ten very artistic arrangements, each containing at least one Amaryllis floret, were contributed by ladies representing a number of local garden clubs. In addition, about 35 single florets, including several in the double division (D-7), were on exhibit and a massed display at floor level of about 70 additional scapes added to the color of the occasion.

In competitive horticulture, six certified judges awarded 86 ribbons: 28 first, 17 second, 23 third and 18 honorable mention. Individual awards were made as follows: Best, potted, registered flower in Division 5, the Ludwig challenge cup and an American Plant Life Society Award of Merit went to Al Diermayer for 'Beautiful Lady.' In the Division 5 competition a close second and an Award of Merit went to J. T. Schmidt for 'Fairyland.' Winner of the best small flower award was B. A. Tower for a potted plant of *A. evansiae.* Mrs. T. K. McKnight received a green ribbon for the best single floret, an unregistered, very greenish white; and Mrs. Jack Welch won the top award in the arrangements for her entry in ''Amaryllis on Parade.'' Three unregistered seedlings in Division 5 received American Plant Life Society Preliminary Commendation awards, two grown by Al Diermayer and one by Clarence J. Crochet. Both sweepstakes awards for most blue ribbons for potted plants and also for cut scapes were won by Clarence J. Crochet.

We were also fortunate to have an outstanding exhibit of more than 60 beautiful flowering orchids by the Baton Rouge Orchid Society and these added significantly to the show.

While we feel that some improvements can be made at our next show, we believe our first show was a very worthwhile event.

CORPUS CHRISTI OFFICIAL AMARYLLIS SHOW, 1968

MRS. CARL C. HENNY, *Vice-President,*
P. O. Box 3054, Corpus Christi, Texas 78404

The Coastal Bend Amaryllis Society held its ninth annual Amaryllis Exhibit in conjunction with the Lola Forrester Flower Show which was held in the City Coliseum for the first time, on April 27th and 28th, 1968. The Texas Garden Clubs, Inc. Convention was held here during March 27th and 28th, so we were really late this year. However, we were very fortunate in having sixty-two entries for judging after all.

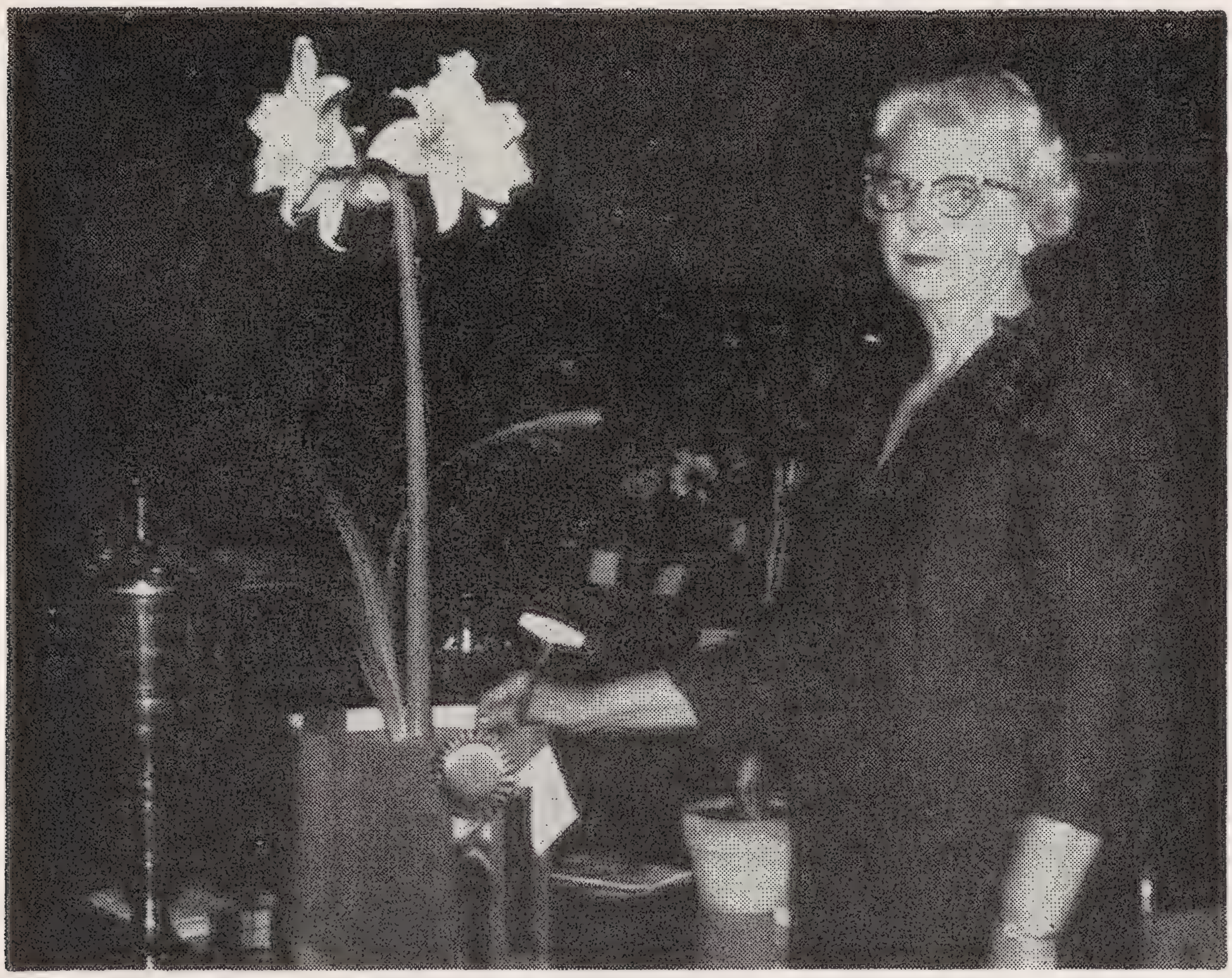

Fig. 7. Mrs. R. A. Hornberger, winner of the Ludwig Challenge Cup at the Official Corpus Christi Amaryllis Show, 1968.

Among the pot-grown Registered Leopoldii Type Amaryllis exhibited were: 'Apple Blossom', 'Daintiness', 'Picotee Petticoat', 'Golden Trumphetor', 'Day Dream', 'Fantasy', 'Royal Dutch', and 'Marion'. The Garden Grown Registered Leopoldii Type included 'Apple Blossom', 'Prima Donna', 'Pink Favorite', 'Winter Carnival', 'Indian Orange', 'United Nations', 'Picotee Square Dance', 'Candy Cane', 'Ludwig Dazzler', 'White Giant', 'Maria Goretti', and 'Royal Dutch'.

Mrs. R. A. Hornberger received 97 points on her pot-grown 'Picotee Petticoat' and was awarded the Ludwig Challenge Trophy for the second time (see Fig. 7). She also received the Judges Award of Merit and the American Plant Life Award of Merit for this lovely specimen plant. She also received a blue ribbon on her entry of 'Daintiness'.

Mr. R. L. Retallack received a ''Special Trophy'' awarded him for his entry in the ''Breeder's Class''. Mrs. Bill M. Miller, a non-member, received a ''Special Trophy'' for her entry of 'Winter Carnival', in the Registered Garden Grown Leopoldii Type.

Mrs. Carl Henny received blue ribbons on her entries of 'Picotee Square Dance' and 'United Nations'. She was also awarded the American Plant Life Award of Merit for 'Picotee Square Dance' which scored 95 points. American Plant Life Awards of Merit were also awarded to Mrs. Robert B. Arnold for her entry of 'Firefly' which scored 96 points, and to Mrs. Levi Materne for her entry of a Belladonna which scored 95 points.

Other blue ribbon winners were Miss Winnie Joiner, for her entry of 'Apple Blossom', which scored 94 points; and to Mr. Richard Blucher in the Breeder's Class, which scored 94 points also. Mr. W. M. Neyland was awarded a blue ribbon on his 'Golden Trumphetor' entry and also a blue ribbon in the ''Breeder's Class''.

Three Accredited National Amaryllis Judges from San Antonio, Texas, Mrs. E. T. Story, Mrs. Larry Miller and Mrs. R. H. Parkinson judged our Exhibit.

1968 SOUTHERN CALIFORNIA OFFICIAL AMARYLLIS SHOW

JOE WERLING, *Show Chairman,*
5139 Hermosa Avenue, Los Angeles, California 90041

As usual with our shows in Southern California we have many anxious days preceding our events wondering if we could collect enough exhibition flowers. Our Fourth Annual Show, ''Amaryllis-Spring Fantasy'' was held on April 27 and 28 at the Los Angeles State and County Arboretum, 301 N. Baldwin Avenue, Arcadia, California. [Fig. 8]

It has been our purpose to encourage the growing of amaryllis in the garden. Much effort is expended by our members to put on a show that will create this interest. We have found this to be rewarding as we note that each year an increasing amount of visitors see our show. As indicated by the multitude of inquiries, the garden enthusiasts are setting aside a choice spot in their garden for these sparkling, pastoral sweethearts of their garden.

Our exhibit entries were comprised mostly of cut scapes. There were sufficient entries of greenhouse pot-grown plants, especially the miniatures and species that added that extra interest.

The awards were as follows: SWEEPSTAKES—Cecil Houdyshel Memorial Trophy (for the most blue ribbons)—Mrs. Bert Williams, So. San Gabriel; RUNNERUP SWEEPSTAKES—Southern California Hemerocallis and Amaryllis Society Award—W. Quinn Buck, Arcadia; BEST NAMED DUTCH (other than Ludwig) 'Orion',—Mrs. Flores Foster, Long Beach; BEST GRACILIS—Joe Werling Award—Mrs.

Bert Williams, So. San Gabriel; BEST SEEDLING—Chairman's Award—Mrs. Eva Turnquist, So. San Gabriel; BEST SEEDLING—Runnerup—Mrs. Kenneth Anderson, La Canada; MOST BLUE RIBBONS in Divisions 2, 3, 6, 7 and 8—Hayes Award—Mrs. Bert Williams, So. San Gabriel; POPULARITY POLL—President's Award—'Golden Triumphator', Mrs. Flores Foster, Long Beach.

Others winning American Amaryllis Society Ribbons were, I. K. Rosoff, S. S. Harshbarger, J. Moramarco, I. L. Doran, C. D. Cothron Duncan Eader.

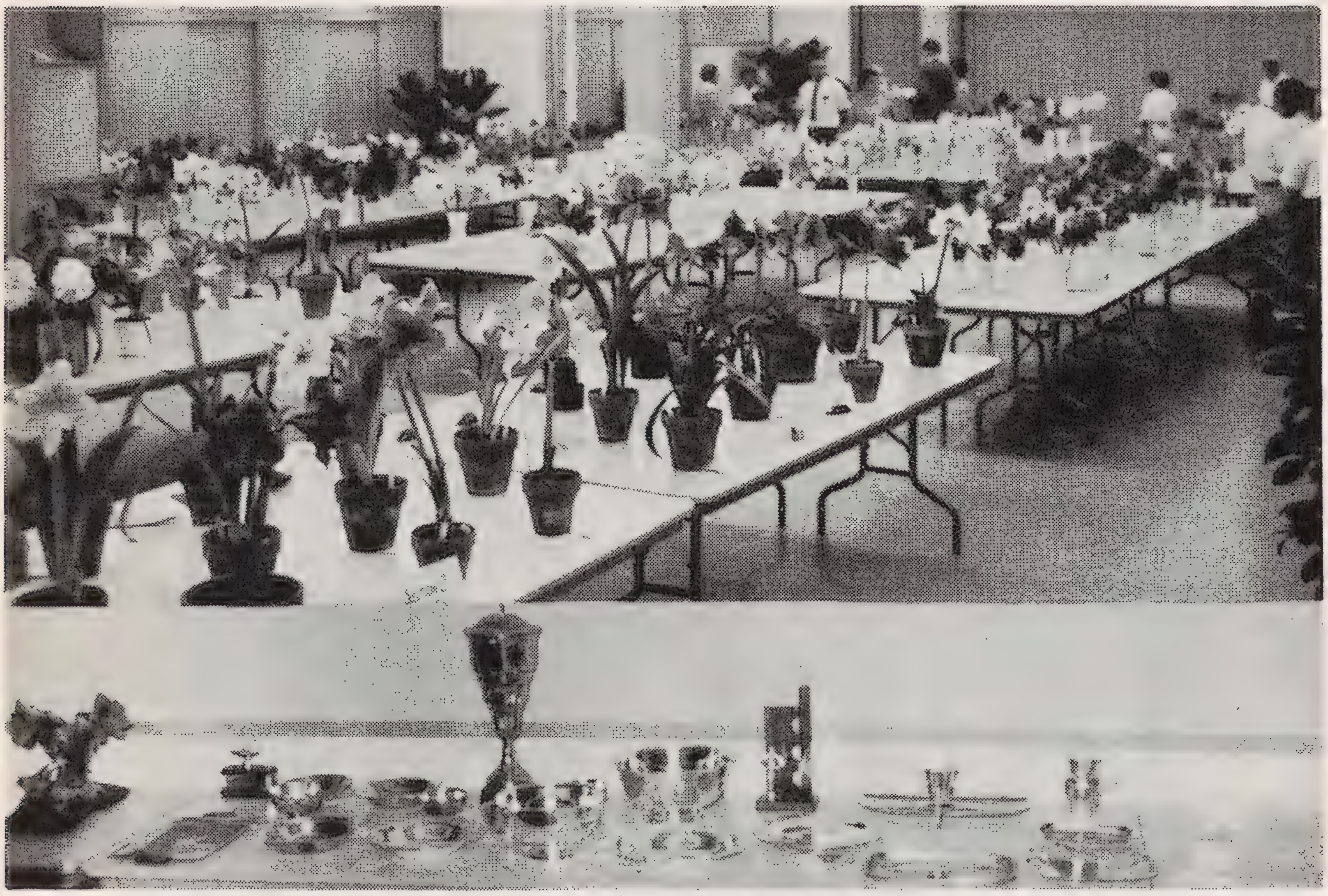

Fig. 8. Southern California Official Amaryllis Show, 1968, Arcadia, Calif. **Upper**, part of exhibits; **Lower**, trophies awarded. Photo by Jack McCaskill.

Southern California Hemerocallis and Amaryllis Society Special Ribbons—Mrs. Marie Turner, A. E. Angell, J. Moramarco.

Outstanding Flowers—'Courtesy', 'Amazon', 'Ludwig's It', 'New Orleans', 'Symphony', 'Pink Beauty', 'Rembrandt', 'Elvira Armayo', 'Orion', 'Golden Triumphator' and the seedlings.

The Judges were: Mrs. Kenneth B. Anderson, Mr. Quinn Buck, Mr. Roger Fesmire, Mr. Jack McCaskill and Mrs. Bert Williams.

Individual gardens were only open to Southern California Hemerocallis and Amaryllis Society members to compare notes on their hybrids, species and seedlings.

The success of any amaryllis show is also dependent on those who contribute flowers for the non-competitive section. To mention a few who have been so generous, we list the following:

Mr. E. A. Angell of Loma Linda, Calif., has been hybridizing for 27 years (see article on page 67, 1964 Plant Life). He has supplied flowers for all of the shows but in the very near future he plans to curtail the number of bulbs he now is growing, as Mr. Angell no longer has the time to continue with so many plants.

Mr. Bruce Claflin of Upland, California, grows Iris and Gerberas in addition to amaryllis. His first showing of amaryllis was in the 1968 Show. His growing grounds are much higher and colder than the majority of our gardens. His flowers are usually not in bloom in time for our shows, but this year, due to a warmer spring, he exhibited some fine seedling blossoms.

Mr. John A. Moramarco of Fontana, California, is a newcomer in amaryllis growing. He is fond of the Angell strain because of the hardiness. He plans to hybridize and improve this strain within itself.

Mr. Walter Horsey of Temple City, California has contributed hundreds of flowers for added color on our exhibition tables. His passing soon after our last show saddened the hearts of many of his friends in the amaryllis world. We are indebted to him for his many fine contributions.

Marie Turner of Temple City has probably grown amaryllis in the open ground in California longer than any living grower. Please note page 59 under other California Breeders in the Amaryllis Manual. She has been a constant supplier for our shows, and we can remember a green seedling of her's that was the hit of the show.

GREATER HOUSTON OFFICIAL AMARYLLIS SHOW, 1968

Mrs. Sally Fox, *1527 Castle Court,*
Houston, Texas 77006

A veritable parade of color greeted visitors to the Greater Houston Amaryllis Club's fifth official show, held in conjunction with the Mens Garden Club Spring Show at the Garden Center on Sunday, April 28, 1968. [Fig. 9]

This was a good growing year for amaryllis, and you name it and you saw it! There were well over a hundred specimens, including the pure white (most popular) and the very delicate pastel shades of pinks into deep rose, salmons and on into the various shades of blazing reds to almost black red. Of course, the bi-colors were not passed by easily as they too drew much favorable comment from the guests.

The trophy table was heavy with beautiful, much sought after, silver prizes. Awards were presented as follows: Mrs. R. A. Fawcett—Ludwig Trophy for potted specimen 'Ludwig's It'. Mrs. Glen Melton—Silver covered dish for Ludwig's 'Sparkling Gem'. Mrs. Chas. Pease—Silver plate for American Meade potted specimen. Mr. E. Joe Pruitt—Silver shell for Dutch seedling. Mr. Kermit L. Warnasch—

Wagner silver tray for Sweepstakes. Mrs. Chas. Pease—Rosette for Sprekelia, ''Other Member of Amaryllid Family''.

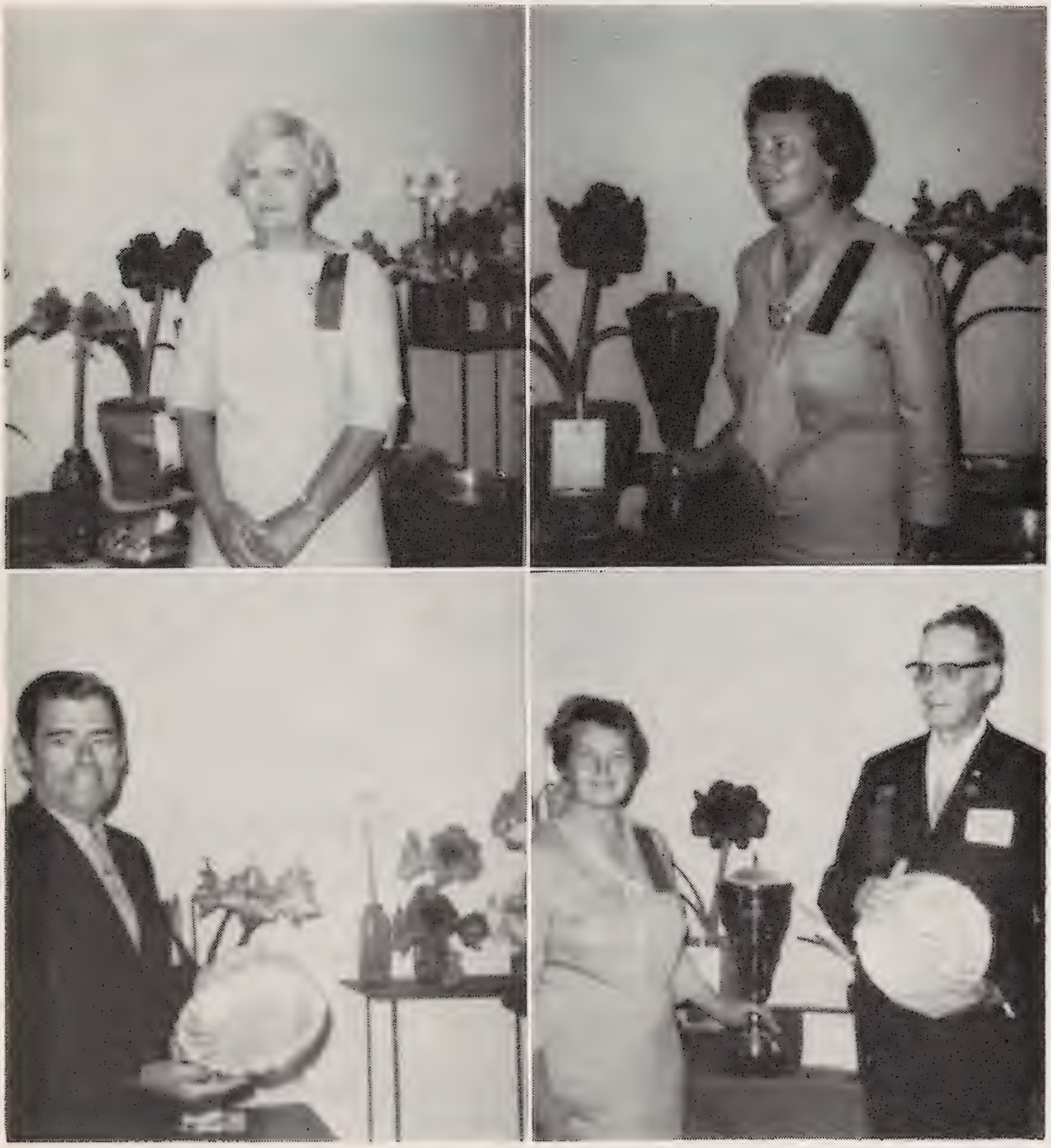

Fig. 9. Greater Houston Amaryllis Club Official Show, 1968. **Upper left,** Mrs. Glen Melton, trophy winner in Miniature Division with 'Sparkling Gem'. **Upper right,** Mrs. R. A. Fawcett, Ludwig Trophy winner with 'Ludwig's It'. **Lower left,** Mr. E. Joe Pruitt, winner with Dutch seedling. **Lower right,** Mrs. R. A. Fawcett, Ludwig Trophy winner with potted specimen of 'Ludwig's It', and Mr. Kermit L. Warnasch, sweepstakes winner.

Arrangements featuring amaryllis were at vantage spots, and added much beauty to the show.

The educational exhibit, which clearly showed the visitors what can be done in this area with amaryllis was a point of much interest, with many questions asked of Mrs. Chas. H. Pease, who was most gracious in giving good growing hints.

Even though it takes from eighteen months to sometimes almost three years to produce a blooming size bulb you can bet a few visiting gardeners who have never tried their hand at hybridizing will do so after viewing the many ribbons presented for seedlings—the result of our own crossings, then growing the seed to mature bulbs. The American Plant Life Society is most interested in these novice hybridizers, and to encourage them further prepared Awards of Commendation which were presented for the best seedlings in the show. There were twenty-two ribbons awarded in this division, which clearly indicates what good results have been achieved.

These bold blooms naturally attract the growers of the Mens Garden Club, in which Mr. Kermit L. Warnasch is an active member and keen competitor. He shared his entries between the two shows; and in the Mens Garden Club show won the coveted Ludwig Trophy with a cut specimen of Ludwig's 'Maria Goretti', a beautiful white amaryllis. The men's division had quite a number of amaryllis and along with their usual extraordinary displays of horticulture and arrangements produced a great show.

Those who attended this joint show had the pleasure of an afternoon long to be remembered.

HENRY VAN WOESIK, A GUEST SPEAKER AT HATTIESBURG

Mrs. Loyd Bond, *Hattiesburg, Miss.*

Mr. Henry van Woesik of Ludwig and Company, Hillegom, Holland, was the guest speaker at the meeting of the Hattiesburg Amaryllis Society, May 29th at the home of Mr. and Mrs. Sam Forbert, 1910 Evergreen Lane.

Mr. Woesik is manager and controlling partner of Ludwig and Company, which is the world's largest grower and exporter of Amaryllis bulbs. Mr. Woesik, who is visiting his customers while lecturing, made Hattiesburg his only stop in Mississippi. Luther N. Davis introduced the speaker, who showed color slides of his plant nurseries and of many Holland gardens. This year Ludwig and Company added four new hybrids to their list: 'Marble Arch', an apple blossom colored clone; 'Moulin Rouge', an improved and darker Royal Dutch; 'Salmon Tower', a salmon color, which is the largest Amaryllis with the tallest stem. He stated that 'Gipsy Giant' is being offered again this season.

Previously, Commissioner Walter Parker greeted Mr. Woesik at the airport and presented the guest with an honorary Hattiesburg citizenship.

The welcoming committee which met Mr. Woesik at the airport included Mr. and Mrs. Sam Forbert, Mr. and Mrs. Davis, Mrs. R. A.

Fowler and Mrs. Katie Jackson. Members of the society and their guests had a buffet supper Al Fresco style. There were seventy-five amaryllis enthusiasts in attendance, including visitors from Columbia, Yazoo City, Jackson, Taylorsville, in Mississippi and Detroit, Michigan.

CATALOGS RECEIVED

HYBRID AMARYLLIS CATALOG, season 1968-69, Robert D. Goedert, P. O. Box 6534, Jacksonville, Fla. 32205. (A) Hybrid Amaryllis Seed, 1968-69; (B) Imported large-flowering Amaryllis, including Dutch Hybrids, South African grown Hybrids, and Harrison's Hybrids.

LUDWIG AMARYLLIS (18th EDITION), Ludwig & Co,m P. O. Box 18, Hillegom, Holland (received August 7, 1968); 32 pages and cover; profusely illustrated in color; listing current offerings of hybrid named registered Hybrid Amaryllis clones and *Cyrtanthus purpureus* (syn.-Vallota *speciosa*).

UNIVERSITY HILLS NURSERY, 1968-69 CATALOG, Claude W. Davis, 470 Delgado Drive, Baton Rouge, Louisiana 70808.

AMARYLLIS JUDGES CERTIFICATES

Since the last report in the 1968 Amaryllis Year Book (page 31), the following numbered Amaryllis Judges Certificates have been issued by the American Amaryllis Society: 170. Mrs. John B. Baird, 6 Westlane, Houston, Tex. 77019 (Horticulture only). 171. Mrs. Wm. T. Danes, 15421 Lakeview Drive, Houston, Tex. 77040 (Horticulture only).

EDITOR'S MAIL BAG—continued from page 22.

The new address of Mr. Sydney Percy-Lancaster is now *36/2 Cantonment Road, Lucknow, India.* He writes under date of August 6, 1968: "It is some time since I wrote you last. I was compelled to give up my job with the Indian Botanic Garden owing to damp quarters which had brought on an attack of arthritis. I went back to Lucknow hoping to 'vegetate' for I am 84 and not as vigorous as I would like to be. Unfortunately I came into a very hot period and got heat stroke. I then rushed up to Kasauli, a hill station near Simla, but the elevation was too high for me in my condition—it is a little more than 6000 ft.—and I developed an unbalanced state that caused me to fall for apparently no rhyme or reason. I had to remain till the monsoon broke on the plains and reduced the heat of summer. I went down by early July, and felt better immediately, then after a stay for a month in Delhi I came on to Lucknow. I am feeling much better and except for the trouble at night fall when I must have support, I am well again. . . . I don't think I will go to 'work' any more but just carry on taking things easy. . . ."

Prof. Penrith B. Goff writes under date of Aug. 26, 1968, that he has assumed duties in the Department of Romance and Germanic Languages in the College of Liberal Arts at Wayne State University, Detroit, Michigan 48202.

2. LINEAGICS

[BIOEVOLUTION, DESCRIPTION, DETERMINING RELATIONSHIPS, GROUPING INTO LINEAGES]

PLANT EXPLORATION TRIPS IN ARGENTINA

Carlos Gomez Ruppel, *Mendoza, Argentina*

I. WINTER TRIP, JULY & AUGUST, 1967

This current trip which included west, central and northeastern Argentina was my longest one and also the most productive that I have ever taken because of the material which was collected and the fine people whom I met.

Leaving Mendoza by ''Belgrano'' railroad on 16th July at 11:30 P.M., I reached ''Dean Funes'', Cordoba, near ''Santiago del Estero'' border at 7 P.M. the next day. There I spent the following two days going up and down the border and all the while making inquiries for *A. parodii* as this is the ''home'' area of the species. But unfortunately I found only two big bulbs one of which weighed a full pound. At this time, the species is dormant but I plan to be there again next December, when I have been told that *A. parodii* is in full bloom everywhere by the thousands!

From thence I went to Tucuman for two days and entered into Salta city which latter town was unknown to me and the many flowering plants growing in this area really surprised me. There, luckily, I met Mr. Filiberto Yanello, a young gentleman, who became a good friend of mine, and who, I hope, will be of great help in the searching out of the species which may be found in the wilds. Further, we did take two good trips together and in one trip, he took me about 40 kms. (about 25 miles from Salta into the ''Camino Viejo de Tucuman'' (Old Road to Tucuman) where we found a good crop of bulbs, especially, of a big *Amaryllis* species which I was told is pink and white, and another one which is a white scented *Rhodophiala* species. Both of these may be new to Science. In what may be a very promising trip during the next Amaryllis blooming season, we plan to go to ''Amaicha del Valle'' and to ''Santa Maria'' in Tucuman where apparently grow *A. Aglaiae, ''red cochuna''*, *A. immaculata, A. tucumana* and some others. After spending this week in Salta, journeyed northward and arrived at ''Embarcacion'' which is near the Bolivian border. There I got more *A. apertispatha* and *A. belladonna* species bulbs which may have possibly come from Bolivia. Then, I took a trip into ''Oran'' and got specimens of an enormous *Hymenocallis* sp. which may be either *fragrans* or *speciosa* (I presume). The amazing development of the species could be due to ecological factors for the plant is evergreen and it looks just like a giant *Eucharis amazonica.*

Then leaving ''Embarcacion'' and after 36 hours of travel, I reached Formosa to pay a visit to Mr. Carlos Carrara, who is both a close personal friend and a good collector of tropical plants. Several nice field trips were taken. One was to "Palo Santo" which is 300 kms. westward into a good area, where after a few hours of exploration we found the place where *A. elegans* var. *"albostriata"* grows, of which we got many bulbs. At this place, this species is evergreen in the fields. Also, in Formosa I got more bulbs of *A. belladonna minor* and *A. belladonna major* which grow in the home gardens and which are of unknown origin.

After a week here in Formosa, I left and spent the day going to Resistencia, Chaco, Corrientes which is the Capital of the same province (State), then on to Posadas, Misiones, and, finally, all in the same day, reached Santo Tome, Corrientes. Here, I was very interested in getting more mature bulbs of *Amaryllis* species "Mrs. Sosa" in Santo Tome; here I had gotten them two years before from a home garden. I presume that it comes from south Brasil or Iguazu Falls, Misiones. It is noteworthy as it is a peagreen self *Amaryllis* of the Elegans Group. If I had found it in Peru, then I would have said that it might be *A. viridiflora.* Unfortunately I was given only 6 mature bulbs which I will send to my friends in California (USA). This species flowered this past summer (1967) in Jacksonville, Florida (USA) for Mr. Alek Korsakoff from whom I quote: "Amaryllis specie Mrs. Sosa" produced very unique flowers of "chartreuse green 663/1, R. C. chart."

Then after another week, I returned home in five days, from Santo Tome to Mendoza by way of Buenos Aires. Now, after exactly a month, I was sleeping in my own bed again.

II. MARCH 1968 COLLECTING TRIP INTO SALTA

Salta, which is situated northward of the 25th parallel in the tropic zone and was the home-base for this collection trip, is a modern, liveable city which while surrounded by mountains and at an elevation of 1,800 meters (s. l.) nevertheless has a mild climate and has the plant, animal life and the scenery to go with it to make it a further inviting place.

Among those that aided me, I am most grateful for the young gentleman, Mr. Filiberto Yanello, who kindly took me on his motorcycle to hunt for new and showy plant specimens, especially Amaryllids. On the 7th of March 1968, we took off for the trip into the "El Chamical" which is a small village of less than a dozen humble houses that they call "ranchos". Surprisingly the houses were provided with running water. There was also a police-station, which had been a "tin rancho", with one police-man. There was also a school which was the main building and was big enough, clean and comfortable. This town was reached thru endlessly winding roads which both curved about and climbed hill after hill which were luxuriantly covered with tropical flora. Many a stop was made to collect conspicuous specimens among those were a *Malvaceae* resembling Hibiscus, having 1½″ wide blooms of deep yellow blotched brown in its center and bearing myriads of blooms and seedpods all at the same time. Further, we found a member of the *Labitae* (?) which was a climber with 3″ long coral red flowers of possibly great horticultural worth; since no seeds were to be found, several roots were taken to Salta. Also in this area, 18-20 ft. cactus were to be found of which the poorer sort of the ''ranchos'' were built but the city-folk used the ''timber'' for ornamental furniture. Among the *Amaryllidaceae* found were *Habranthus brachyandrus* which were identified from their leaves, roots and habitat. In ''Chamical,'' itself, were found some cultivated *Hymenocallis* plants of which several enormous bulbs were dug-up for identification. They told Mr. Yanello that a broad leaved red *Amaryllis* and another white one grew also in this area. After a long search, we found 3 spots that had the supposed species. Two of the spots were rather close to each other on the bank of a dry river. The bulbs were big and the leaves measured some 70 cm. long and 5 cm. wide. We were told that they had white flowers. Later, we located the third spot on the dry top of a low ''cerro'' (the local name of a mount, need not necessarily be high). On that ''cerro'' we found, happily, many, many bulbs of a broad-leaved *Amaryllis* sp. and one bulb of a narrow white-striate leaved species. We have given the collection number to the broad-leaved species as *A. Ch. 1-68* (*Amaryllis* ''Chamical'' 1-1968). We gathered plenty of this material for further study. And on the way back to Salta, we gathered *Tillandsia, Bromelia, Chlores, Koehleria* and *Oncidium* species.

On the next day, we headed 30 Kms. northward on the road to Jujuy to ''La Calera'' which was more humid and warm but with grand scenery. The flora was commonly ferns, Begonias, Cacti and Bromeliad species, including the interesting epiphyte *Tillandsia*. We saw large groups of *Koehleria* species with several different shapes to the blooms and a range of colors, with the ventricose vivid orange and yellow, and the trumpets mauve, scarlet, red, pink, etc. They appeared to be natural hybrids. But what I was particularly hunting for was *Alstroemeriales* in the area and was lucky to find some *Bomarea* spp. of which 5 plants, possibly, of B. *rosea* were dug up.

Our next area of search was on the 11th into the ''Guemes''. This area is both dangerous and the climate is hot. The city, ''Guemes'', is located 55 Km. Eastward of Salta. In this ''Guemes'' area, what complicates the collecting of *Amaryllidaceae* is the presence of snakes—*Ophidium* with lethal poison, the aggressive ''Yarará'' (*Bothrops neuwiedii & Bothrops alternata*), the less dangerous ''víbora de Cascabel'' (*Crotalus terrificus*)—altho having the most ''mortal weapon''—does warn us of its presence by the noise of the rattles at the end of its tail; and lastly, the ''vibora de coral'' (*Micrurus lemniscatus*) which is the most venomous, but human victims are fortunately very rare. Well, keeping a wary eye on the reptiles, we found a few Kms. northward of ''Guemes'' an *Amaryllis* species that was growing by the hundreds. It resembles *A. parodii* from the likeness of the bulb, leaves and habitat. The Folk told us that the flowers are long, green-yellowish trumpets. From among these, we gathered about 20 huge bulbs. Also, close to these were taken some bulbs of an Amaryllid which looked like a *Rhodo-*

phiala species. Both of these were found in an area where the thorny *Bromelia* species and the *Synadrospadix vermitoxicum* (Araceae), with its large ornamental, deciduous leaves, grow everywhere.

On the way back to Salta, we collected more *Tillandsia* and *Bromelia* species. One enormous, glossy green-leaved *Vriesia* species and an ornamental climber bearing deep coral red flowers in profusion (the same Labiate previously mentioned) were also collected. One additional warning to all about a small danger. In spite of the heat, do not carelessly take a bath in the clear streams of water to wash off the perspiration, and to refresh yourself. I sank happily into the cooling stream. But to my great surprise, on getting on the bank again, I saw my body literally covered by hundreds of little fleshy colored leeches (*Hirudus* sp.) that were difficult for us to take off. My friend, Yanello, had laughed a lot when he refused to join me in the water.

SOME AMARYLLIDS COLLECTED BY DR. RUPPEL

Paul H. Williams, Jr., *6128 Sundown Drive,*
Fort Worth, Texas 76114

Due to the efforts of Dr. C. Gomez Ruppel many amaryllid species from South America are now being grown in various sections of the United States. We owe him a great debt of gratitude for his tireless hours spent in tracking down rare and unknown species of the Amaryllidaceae and attempting to naturalize them in comparable climates of this country. His reward will be eventual increase of world botanical knowledge.

A few years ago the writer received bulbs from that most active member of The American Amaryllis Society resident in Mendoza, Argentina. Among these were two *Habranthus* species received as *H.* ''Barreiros'' and *H.* ''Burkart''. Both have proven adaptable to the conditions found in Fort Worth and should be brought to the attention of the Society at large.

The first is a possible form of *H. robustus,* but Dr. Ruppel made known his doubts; its delicate light pink is evenly shaded throughout the flower. This species blooms, with or without foliage, at the same time as *H. robustus* and occasionally during the summer and fall. Flower size and seed set compare with *H. robustus* but the scape is shorter and bloom is more graceful. Its true relationship is left to the lineagicist to puzzle out. The writer has small seedlings of a supposedly white form. The above species was collected by Dr. Gomez Ruppel at Barreiros Beach, Florianopolis, Capital of Santa Catarina, South Brazil.

The second species is new! At least I have not located it in Herbertia or Plant Life. This one has been described as giving the appearance of a giant white flowered form of *H. andersonii rosea.* It blooms along with *H.* ''Barreiros'' but does not set seed as freely. ''Burkart'' has a light brown shading deep in the throat which is carried forward throughout the bloom as very fine veins of the same color. The general effect is an off-white color. The flower appears to be sensitive to the amount of light received; being trumpet shaped in shade and open faced in full sun. This species is native to Entre Rios, Argentina and was given to Dr. Gomez Ruppel by his friend Father Arthur Burkart, an Argentine botanist.

A beautiful addition to the Belladonna Group of *Amaryllis* was received as *A.* ''belladonna minor''. This is another of the fast growing collection of miniatures. A dependable, free blooming species (3 scapes to bulb) which crosses readily and is self-fertile. The flower is a glowing shade of rose with a large yellow eye banded by darker rose. It blooms during late winter and early spring while in full foliage, which does much to enhance the picture.

Other species still await flowering, and will be reported on later.

NOTES BY AN AMATEUR COLLECTOR

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The following notes are concerned with exploration trips that were made during four years: (a) 1964, August & September, Peru; (b) 1965, September & October, eastern Venezuela and southeastern Brasil; (c) 1966, October & November, southern Brasil and northwestern Argentina; and (d) 1967, October and November, Bolivia, northern Peru and Ecuador.

On October 10, 1967, I saw *Chlidanthus boliviensis* brought to the market in Cochabamba by Indians. Brilliant yellow with up to twelve flowers on a scape, and very strongly perfumed. It grows near the top of the Sierra Tachna to the north of Cochabamba. Bulbs were found at an elevation of ten to twelve thousand feet, growing in a clay soil. Cochabamba gets about eighteen inches of rain in two or three months then none until the next year.

Dr. Cardenas states that with the exception of *Amaryllis belladonna* and *A. reginae,* all the amaryllis he has found are growing in a subtropical climate, not in hot, humid areas. *A. starkii* has been found only in a small area which is about 150 kilometers west of Corumbá, Brazil. It grows in a nearly pure sand in sandstone mountains with the name of Sierra Santiago. Rainfall is about 40 cm. per year.

Amaryllis Cybister is found on the north and east slopes of Sierra Tunari growing in very rocky clay soil in partially shaded places. This area has no rain for nine months of the year.

Amaryllis psittacina is another species that grows usually on steep bare rock, which has a thin layer of moss on it, of course some dust and debris collects in the moss. I found that often the roots were two feet long in the moss which is wet every night by dew and at some seasons of the year by condensation of fog. Another noticeable thing about *A. psittacina,* almost always it is found at the side of a plant of *Vriesia reginae.* The *Vriesia* is usually a large one, probably eight to ten years old and three or four feet in diameter. It would shade the rock and perhaps keep it cool. *A. psittacina* grows at an altitude of 1-2,000 meters at a latitude of 22 degrees south. There are several months of little rainfall but the wet season is during the hot months. In this area they have some very hot days and the rock gets very hot. In 1966, I traced *A. psittacina* for about one hundred miles to check its variability and found that the amount of white appearing in the flower was quite variable but although the range is extensive no pattern was apparent. Some plants grow at the base of the cliffs below where the majority grow. Careful digging showed that the root system was smaller in extent and the roots bigger in diameter. The soil grown bulbs were bigger and the flowers smaller.

Amaryllis striata has been seen south of the range of *A. psittacina* on the Cerro do Mar beginning at Campo Grande. We followed it for about a hundred miles but did not determine the end of its range because we went west from here. *A. striata* grows in this region in a rain forest area where they receive 4,000 mm. of rain. I found it growing in small level areas near the top of the mountain with scapes 60 to 70 cm. high and gorgeous, nearly orange flowers about 125 mm. in diameter with leaves nearly 90 cm. long in almost complete shade. This area has little diurnal change in temperature but gets near freezing on an occasional morning in the winter.

In 1966 we went west from Curitiba to the Rio Paraná where we found *A. reticulata* var. *striatafolia* growing. This bulb bloomed shortly after we returned to California. It was selfed and the resulting four seed produced three plants with no white stripes on the leaves.

I found the first plant of what I believe to be *A. santacatarina* about fifty miles north of Puerto Iguasú. It was in bloom with green spathe valves. Later I found many plants with the same flower two hundred and fifty miles south of this place with green spathe valves. I was told that there was an amaryllis—small yellow flowers in this area but did not find it.

At Puerto Iguasú I waited four days for an airplane which radioed in that it would not come because of a storm at Corrientes. Later radioed that if it came, would be too late to fly out that night—the airstrip was a narrow lane cut out of the forest with no lights or navigational aids. While waiting for the pilot to make up his mind, I went to an abandoned hotel near Iguasú falls where I found the whole front planted to *A. santacatarina* and all in bloom. What a blaze of color!! Upon returning to the airport, found that the plane was coming. It started to rain! Was now completely dark but the pilot said he would go. They put three kerosene lanterns about a foot apart at the end of the runway and a couple along the side. We took off in a blinding rain with the lightning crackling.

Species observed growing in northwest Argentina were *A. aglaiae A. immaculata, A. ambigua* and *A. parodii.* It was told that this area has a long dry period which must be observed if these bulbs are to prosper. The exception *A. aglaiae,* which is evergreen, grows in natu-

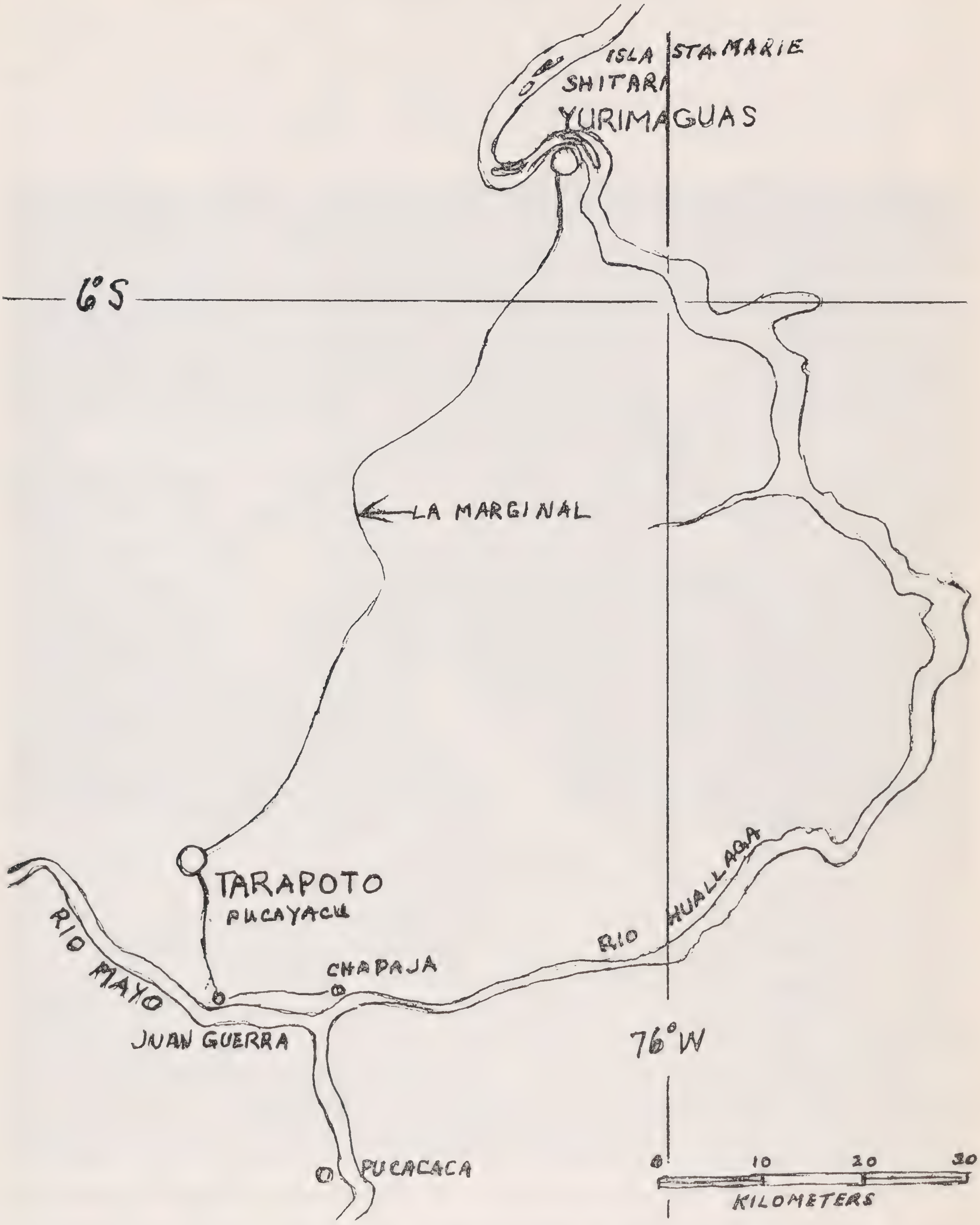

Fig. 10. Map showing the northern part of the Province of San Martin, Peru, in the upper reaches of the great Amazon River Valley where J. L. Doran collected amaryllids. Consult your atlas if more information is desired on this location.

rally damp places. A heavy shade from a summer weed crop protects it in the hot season. The soils of Argentina are clay loams, grey in color, rich in mineral—unlike the tropical red clays. In one area near Tafi de Valle, *A. aglaiae* was growing so thick it covered the sides of the barrancas. Near Vulcan, *A. immaculata* also was observed growing so close together you could not step without crushing some of the leaves.

Santa Cruz, Bolivia is a town of over 100,000 population and not one passenger car was seen here. Only jeeps or trucks; it takes four wheel drive to get through the streets. *A. belladonna* was observed growing all through the city and surrounding villages, in gardens and in wooded areas. Almost every flower set seed.

Also seen is probably *A. pardina* and in two distinct forms. One is dotted heavily with only a hint of striping (where the dots run together); the other is so heavily dotted that it is almost a solid color, but both are white on the back side of petals. Dr. Cardenas thinks these are "escapes" and were brought from the Rio Beni area by early colonists.

Travel to the south of Santa Cruz revealed an area becoming drier and with more cactus and bromelia. Hundreds of *Bromelia serra* were seen in bloom.

In 1964 we went from Juanjui up the river to Tinga Maria and across the Pacalpa. On this trip we found *A. reginae,* an unidentified one, and many *A. belladonna* of various forms and colors. The unidentified flower is white, trumpet shaped with a few fine red lines. Many *Eucharis grandiflora* plants were seen, but near Tinga Maria a very small flowered *Eucharis* was found. We went through El Bocharón de Padre Abat which is a deep canyon with a river in the bottom and several waterfalls flowing into it. On this trip we stopped in Iquitos where grows the biggest flowered *A. belladonna* with wide petals. It always seems to grow in the open places in full sun. The clumps of bulbs get two feet in diameter and all seem to serve as an ant's nest. The several kinds of ants in Peru teach one great respect. One, the natives call "Isura", makes you sick for two or three days. Another called "Tinga tierra" is given a wide berth by the natives.

On a trip up the Rio Mañan we found another distinct kind of *Eucharis,* small with reflexed petals.

In 1967 I was determined to collect *Amaryllis traubii.* We visited Dr. Ferreyra and obtained exact instructions from him. We took José Gómez Carrión, one of his instructors from the university with us. Upon arrival at Pucayacu (Fig. 10) near Tarapoto, we found that most of the area was under cultivation—tobacco. Travel was difficult because the area is covered with brush about twenty feet high. In the open areas were found *A. belladonna.* After two day search we found only a beautiful rose-colored *A. belladonna* growing in dense shade. We went from here down the Rio Huallaga below Yuramaguas to Shitari in search of *Amaryllis ferreyrae* and *Eucharis ferreyrae.* A search of the islands and shoreline revealed only *Amaryllis belladonna.* We did find three kinds of *Eucharis* and hope that one of them is *Eucharis ferreyrae.*

AMARYLLIS ESCOBARURIAE FROM YUNGAS OF LA PAZ, BOLIVIA

MARTIN CARDENAS, *Cochabamba, Bolivia*

The Province of Sud-Yungas has been indicated as the habitat of several *Amaryllis* species. I have collected there *A. belladonna* L., *A. pardina* Hook f., *A. yungacensis* Cardenas & Nelson, *A. forgetii* (Worsley) Traub & Uphof, and now *Amaryllis escobaruriae* Cardenas (Fig. 11).

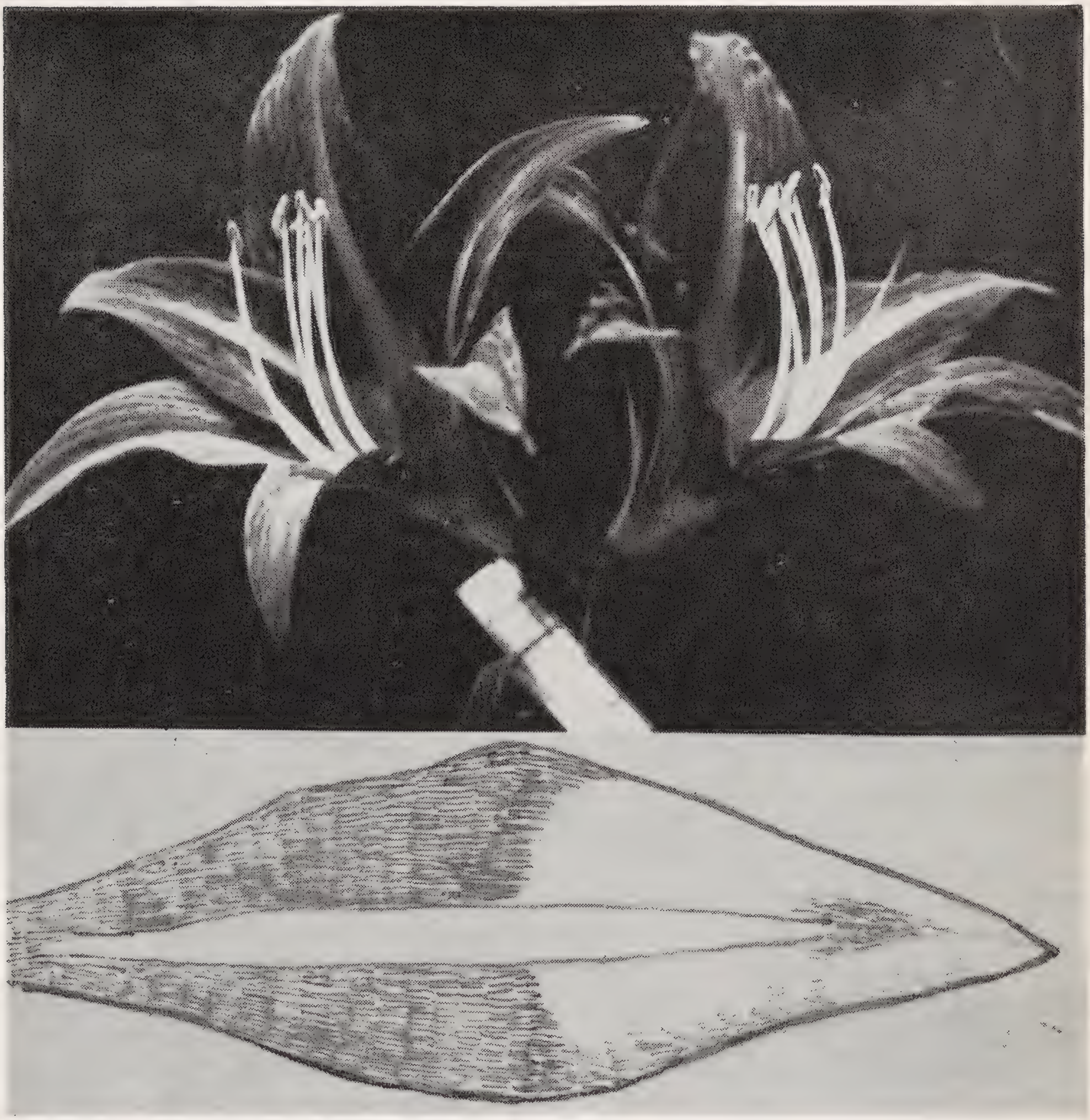

Fig. 11. **Amaryllis escobaruriae** Cardenas, **sp. nov.**

This species reminds one remotely of the Brasilian *Amaryllis moreliana* (Lemaire) Traub by its green star in the throat reaching about to the middle of the petepalsegs. However, *Amaryllis escobaruriae* differs from it by the darker tepalsegs which are acute at both ends and have whitish star bands reaching almost to the tips of the tepalsegs.

This species has been named for the La Paz Burgomaster, General Armando Escobar Uria, who organized this year (1968) the first flower show in La Paz, and brought back from the high mountains of Comanche, Bolivia, at 4,000 m., a whole fruiting specimen of *Puya raymondii* Harms.

Amaryllis escobaruriae Cardenas, **sp. nov.** Fig. 11.

Bulbo globoso 7 cm. diam. Pseudocollo 7 cm. long., 3 cm. crasso. Foliis plusminusve 6 deorsum deflexis, lineari lanceolatis 30—40 cm. long., 3.5 cm. latis a basim angus tatis, connatis vel vaginatis, atro viridis. Scapo 28—30 cm. long., 1.5 cm. a basim crasso. Umbella 2 flora. Bracteis spathaceis acuto lanceolatis 9 cm. long., 0.5 cm. latis, rubis. Pedicellis 5—6 cm. long., diluto viridis. Floribus actinomorphibus 12 cm. long. Ovario 12 mm. long., 5 mm. crasso atro purpureo vel nigrescente. Tubo 1 cm. long. Setepalsegmentis lanceolatis 12x4 cm. a basim atro purpureis, exteriora superne atro rubis, inferne diluto viridis, interiora superne rubis inferne dilutissime viridis, 5 mm. lata balteus albus linea media praeditis. Petepalsegmentis 10x3 cm. lanceolatis, similia coloribus tamquam setepalsegmentis, omnis segmentis ad cuspis acutis, deflexis. Paraperigonium albo viridiscentibus. Staminibus 9 cm. long.; filamentibus albidus. Stylo 10 cm. long., superne albido, inferne purpureo. Stigma trilobata 2 mm. crassa atro purpurea. Capsula trilocularis 18 mm alta, 26 mm. crassa. Semina membranacea, alata, atro brunea 10-15 mm. diam.

Patria: Bolivia. Provincia Sud-Yungas. Departamento La Paz, prope vicinis supra Puente Villa, 1,700 m.

Bulb globose 7 cm. diam., neck 7 cm. long, 3 cm. thick. Leaves about 6 in two distichous sets deflexed laterally, 30—40 cm. long, 3.5 cm. wide at its middle section, narrowed at base, acute at apex, dark green. The basal leaves membranous below, forming a sheath around the upper ones. Scape 28 cm. long, 1.5 cm. thick at base. Umbel 2 flowered. Spathe bracts 9 cm. long, 0.5 cm. wide, acute, red. Pedicels 5—6 cm. long, light green. Flowers fairly regularly actinomorphic. Ovary 12 mm. long, 5 mm. thick, very dark purple to blackish. Tube 1 cm. long. Setelpalsegments lanceolate, acute, 12x4 cm., dark purple like ovary at its base, light green below, dark red above outside; very light green below, red above with a middle whitish 5 mm. wide band inside. Petepalsegments 10x3 cm. of the same color as that of setepalsegments. All segments acute at base and tip, loosely separate and deflexed. Paraperigone very light green as it is at the bottom of the flower inside. Stamens 9 cm. long; filamets whitish. Style 10 cm. long, whitish below, purplish above. Stigma 2 mm. thick, trilobate, dark purple. Capsule when ripe glaucous, trilocular, 18 mm. high, 26 mm. in diam. (It is interesting to note that the capsules of this species, with flowers similar to those of *A. pseudopardina (A. leopoldii)*, are rather flat as in *A. belladonna* L. and not vertically elongate as in *A. pesudopardina.*) Seeds membranaceous, *unusually small,* 10-15 mm. in diam., dark brown. They suggest those of *A. cybister.*

Bolivia: Province of Sud Yungas. Department of La Paz. Heights of Puente Villa, 1,700 m. July 1967. M. Cárdenas, No. 6296 (Holotype) in Herbarium Cardenasianum.

CRINUM 'QUEEN EMMA' IDENTIFIED

L. S. HANNIBAL, *Fair Oaks, Calif.*

Several serious attempts to pinpoint the particular type of red-flowered Asian *Crinum* named after the last Queen of the Hawaiian Islands, Queen Emma, became nearly hopeless when we found at least six specific red-flowered forms from Asia growing in the older gardens of Honolulu along with numerous intraspecific hybrids. The Bishop Museum could not clarify the matter; in fact one reference quoted the white flowered *C. asiaticum* since several variants are grown about the islands. Recently Paul Yamanaka had occasion to visit the Queen's summer home at Lawai on the Island of Kauai where her gardens have been kept intact, and found that the "Queen Emma Crinum" there were entirely *C. augustum* in lieu of the anticipated colored Asian Crinum. Proper plantings of *C. augustum* are now being reestablished at the Queen Emma Museum in Honolulu.

All horticultural examples of *C. augustum* observed in Mexico, Florida and Hawaii appear to be identical and completely seed sterile in all locations. There appears to be no record of the species being recollected in the wild. Thus it appears we either have a sterile cultivar or a single hybrid in circulation. This view was also expressed by William Herbert in his treatise of 1837.

AMARYLLID GENERA AND SPECIES

HAROLD N. MOLDENKE

[In this department the descriptions of amaryllid genera and species, particularly recent ones, translated from foreign languages, will be published from time to time so that these will be available to the readers.]

Allium roguense M. E. Peck, Proc. Biol. Soc. Wash. 49: 109. 1936. Bulb almost globose, 10—12 mm. long [says "tall", probably means long], the exterior scales splitting into fibers, the fibers persistent; leaves 2, shorter than the scape, 1 mm. wide; scape 1.5—2 dm. tall, very slender. terete; bract solitary, opened at one side almost to the base or deeply split, long caudate-acuminate; umbel about 10-flowered; pedicels 8—12 mm. long; perianth 1 cm. long, rose, the segments oblong-lanceolate, scarcely acute, becoming involute, saccate at the base; filaments half as long as the perianth; ovary without a plume [or crest].

Pancratium leavenworthii Standl. & Steyerm. in Amer. Midl. Nat. 36: 166. 1946. Bulb ovoid, about 4 cm. long and 2.5 cm. broad, contracted into a short thick neck; leaves long-petioled; membranous in drying, the petiole very slender, to 19 cm. long, scarcely 2 mm. broad near the middle, the blade lanceolate-oblong, 15 cm. long, 3 cm. wide, acute or acuminate at the apex, acuminate at the base but abruptly contracted into the petiole, slightly paler beneath; scape about 30 cm. tall, scarcely 3 mm. thick near the middle, 2-flowered, the flowers sessile; valves of the spathe lanceolate, scarious, 4 cm. long, attenuate, slenderly nerved [=veined]; ovary about 8 mm. long; perianth white, the tube very slender, 7 cm. long, 1.3 cm. broad, slightly widened upwards, the segments linear, equaling the tube, slightly over 1 mm. broad; filaments very slender, shorter than the segments; anthers appendiculate at the apex, the appendiculation curved outwards, 3.5 mm. long; staminal cup narrow, 15 mm. long, 5 mm. wide.

Chlidanthus x *traubii* forma *oblongitepala* Moldk., *forma nov.* A forma typica speciei segmentis tepalorum oblongis ad apicem subrotundis recedit. Typus: No. 1090 (TRA), cult. La Jolla, Calif.

Veltheimia x *traubii* Moldk., *hybr. nov.* Planta hybrida "*V. glauca* Jacq." et "*V. capensis* DC." intermedia; foliis glabris et plantae florescentia praecoci velut in parenta mascula; aliter intermedia. Typus: Traub No. 1085 (TRA), cult. La Jolla, Calif.

REGISTRATION OF NEW AMARYLLID CLONES

Mr. W. D. Morton, Jr., *Emeritus Registrar*

Mr. James E. Mahan, *Registrar*

Mrs. Emma D. Menninger, *Associate Registrar*

This department has been included since 1934 to provide a place for the registration of names of cultivated **Amaryllis** and other amaryllids on an International basis. The procedure is in harmony with the International Code of Botanical Nomenclature (edition publ. 1961) and the International Code of Nomenclature for Cultivated Plants (edition publ. 1958). Catalogs of registered names, as well as unregistered validly published names, will be published from time to time as the need arises. The first one, "Descriptive Catalog of Hemerocallis Clones, 1893-1948" by Norton, Stuntz and Ballard was published in 1949. This may be obtained at $5.00 prepaid from: Dr. Thomas W. Whitaker, Executive Secy., The American Plant Life Society, Box 150, La Jolla, Calif. Catalog of Hybrid Nerine Clones, 1882-1958, by Emma D. Menninger; and Catalog of Brunsvigia Cultivars, 1837-1959, by Hamilton P. Traub and L. S. Hannibal, were published in 1960 Plant Life, with additions to both in Plant Life 1961. In Plant Life 1961, the first edition of The Genus X Crinodonna was published which serves also as a catalog of cultivars. In Plant Life 1964, the first edition, of "Catalog of Hybrid Amaryllis Cultivars, 1799 to Dec. 31, 1963" was published. Other catalogs of cultivated amaryllids are scheduled for publication in future issues.

The registration activity of the American Plant Life Society was recognized when at the XVIth International Horticultural Congress, Brussels, 1962, the Council of the International Society for Horticultural Science designated the American Plant Life Society as the Official International Registration Authority for the cultivars of **Nerine**; and this was extended to include all the **Amaryllidaceae** cultivars, excepting **Narcissus** and **Hemerocallis,** at the XVIIth International Horticultural Congress, 1966.

Only registered named clones of Amaryllis and other amaryllids are eligible for awards and honors of the American Amaryllis Society at Official Amaryllis Shows.

Correspondence regarding registration of all amaryllids such as **Amaryllis, Lycoris, Brunsvigia, Clivia, Crinum, Hymenocallis,** and so on should be addressed to Mr. James E. Mahan, Registrar, 3028 Palmyra St., New Orleans, Louisiana 70119. The registration fee is $2.00 for each clone to be registered. Make checks payable to American Plant Life Society.

REGISTRATION OF NEW AMARYLLIS CLONES, 1968

Registered by Ludwig & Co., Hillegom, Holland

'Marble Arch' (Lud. 1968) R; A-873; D-4B; U-4 fld.; 26-28″ H; 8″-9″ diam; white with light Dawn Pink (523/2) almost marble colored with whitish apple green throat; spr.

'Moulin Rouge' (Lud. 1968) R; A-874; D-4B; U-4 fld.; 22″-24″ h; 7″-8″ diam.; deep, velvety orange red, lighter towards middle of petals (almost scarlet 19/1) with suggestion of white streak across petals ending in whitish apple green in throat; spr. and win.

'Salmon Tower' (Lud. 1968) R; A-875; D-4A; U-4 fld.; 30″ h.; 9″-10″ diam.; light Mandarin Red (17½) with suggestion of azalea pink towards middle of petals, darker throat; spr. and win.

Registered by Edward C. Prudhomme, Metairie, La.

'Nova' (Prud. 1968) R; A-869; D-4B; U-4 fld.; 24″ h.; 7″-8″ diam.; striped with Jasper red splashes on white base; spr.

'Satellite' (Prud. 1968) R; A-870; D-4B; U-4 fld.; 24″ h.; 8″ diam.; red stripes on a white base with pale apple green throat; spr.

Registered by L. L. Laine, Chalmette, La.

'Red Twist' (Laine 1968) R; A-871; D-6; U-4 fld.; 20″ h.; 5½″ diam.; chrysanthemum crimson (824) with darker veins running through petsegs; spr.

Registered by Albert T. Diermayer, Metairie, La.

'Jules Robert' (Dirm. 1968) R; A-872; D-5A; U-4 fld.; 20″ h.; 6″ diam.; brick red with white ribs in center of segs, blending to green in throat; spr.

HYBRID **NERINE** CLONE

Registered by Hamilton P. Traub, La Jolla, Calif.

'Alma Moldenke', a clone of **Nerine** x **traubianthe** Moldk., named in honor of Mrs. Harold N. Moldenke. Parentage: **Nerine filifolia** Bak. ♀ x **Nerine** clone 'Rosalba' ♂.

Bulb medium sized, producing offsets readily so that a 6-inch pot will soon be filled, the bulbs together producing 10 or more flower scapes in the autumn; propagation may also be by vertical bulb-cuttage (see Plant Life 1968, page 102-103; and Plant Life 1967, [Suppl.] Review of the Genus **Nerine** Herb., page 32). **Leaves** evergreen, several, deep green, linear, canaliculate, to 32 cm. long, to 6 mm. wide, narrowed slightly below, and to bluntly acute above. **Scape** slightly compressed with rounded edges, to 50 cm. long, 4x6 mm. in diam., medium green. **Spathe** 2-valved, green, held horizontally, 5—6.5 cm. long, lanceolate, bluntly acute. **Umbel** to 13—14-flowered; flowers long lasting, held more or less upright, a pleasing medium **Phlox** pink (HCC 625/1). **Pedicels** green, slender, 3-4-5-5.5-6 cm. long. **Ovary**

3 mm. high, 4 mm. in diam., greenish-reddish. **Perigone** zygomorphic, tepalsegs linear, recurved in upper ⅓, 4.2 cm. long, 5 mm. wide, bluntly acute. **Stamens** (and style) fasciculate-declinate-ascending, shorter than the tepalsegs. **Style** trifid, lobes recurved.

ADDITION TO AMARYLLIS SHOW SCHEDULE

Following the groups A, B, and C on pages 46 to 48, 1958 PLANT LIFE, the following artist's group is to be added:

D. ARTIST'S SECTIONS

SECTION XII.—Paintings of Amaryllis and other amaryllids.
SECTION XIII.—Drawings of Amaryllis and other amaryllids.
SECTION XIV.—Sculptures (bas-relief) of Amaryllis and other amaryllids.

AMARYLLID NOTES, 1969

Hamilton P. Traub

Narcissus humile (Cav.) Traub, *comb. nov.* Syn.—*Pancratium humile* Cav. Ic. pl. 4. 1791-1801.

Section *Tapeinanthus* (Herb.) Traub, *sect. nov.*, genus *Narcissua* L. Syn.—*Tapeinanthus* Herb., Amaryll. 190, 414. 1837. Typus: *Narcissus humile* (Cav.) Traub.

Infragenus *Orthogonios* Traub, *infragen. nov.*, Genus *Galanthus* L. (Amaryllidac.) celluluis epidermalibus rectangularibus. Typus: *Galanthus platyphyllus* Traub & Moldenke.

Epidermal cells rectangular.

Brunsvigia x *parkeri* W. Wats. ex Traub, *hybr. nov.* Plantae hybridae inter "Brunsvigia rosea (Lam.) Hann." et "B. major Traub" cum speciebus aliis hujus generis, inter parentes mediae et per procreatio genitura selectiva inter hybridas postea proficientae.

Hybrids of Brunsvigia rosea and B. major with other Brunsvigia species, intermediate between the parents and later improved by selective breeding among the hybrids.

Holonomenifer (typus): No. 823 a+b (TRA), 10-15-60. Paranomenifers: No. 818 a+b (TRA) & No. 816 a+b (TRA), all cult. La Jolla, Calif.

Syn.—"Amaryllis x spofforthiae Herb." Amaryll. [278], 422, 425, 1837, *nomen;* "Amaryllis x parkeri W. Wats.", in Gard. Chron. Feb. 6, 1909, p. 92 et *ibid.* 50(2): 210, fig. 101. 1911; *ibid.* 1(1911) 211; The Garden 75: 462, fig. on p. 460. 1911; Worsley, in Jour. Roy. Hort. Soc. 51: 66. 1926; Hoog, in Herbertia 2: 113-114, pl. on page 113. 1935; "Brunsdonna parkeri alba W. Wats. ex Worsley", in Gard. Chron. Nov. 14, 1925, pp. 391-392, fig. 164; Worsley, in Jour. Roy. Hort. Soc. 51: 64-65; 66, 67. 1926; Gard. Chron. lxxxiv: 331, with illus. 1928; "Brunsdonna sanderae Hort.", Gard. Chron. 50(2): 210. 1911; The Garden 75: 462. 1911; "Brunsdonna tubergenii Hort.", Haggag, in Hort. Rev. Egypt. No. 39, p. 5, with illus. 1918; "Brunsvigia x parkeri (W. Wats.) Traub", in Plant Life 5: 124. 1949; ibid. 16: 58. 1960.

Brunsvigia x *tubergenii* Traub, *hybr. nov.* Plantae inter "*Brunsvigia major* Traub" et "*B. josephinae* (Red.) Ker-Gawl." hybridae et intermediae.

Hybrids of *Brunsvigia major* Traub and *B. josephinae* (Red.) Ker-Gawl.; intermediate between the parents.

Holonomenifer (typus): No. 810 a+b (TRA), 8-27-60, cult. La Jolla, Calif.

NEW MEXICAN ALLIUM SPECIES

Allium huntiae Traub., *sp. nov.*, Plant Life 24: 136-137. 1968, *anglise.* Bulbo ovoideo solitario; foliis 2 linearibus canaliculatis usque ad 4 mm. latis, deorsum vaginatis; umbella laxa 11—18-flora; pedicellis 1.5—2.2 cm. longis; perigonio late campanulato; tepalis 7 mm. longis; staminibus styloque tepalis brevioribus; capsula obscure 6-cristata.

Typus: Howard 67-19B (=no. 1077 TRA), July 22, 1967, west of Durango, Dur. Mex., Highway 40, K. 1016.

Allium mannii Traub & Howard, *sp. nov.*, Plant Life 24: 138. 1968, *anglise.* Bulbo oblongo per fissuras verticales augmenti; foliis 2—4 canaliculatis 3.5—5 mm. latis deorsum vaginatis; umbella 15—25-flora laxa; pedicellis 2.2—2.5 cm. longis; perigonio albo late campanulato, tepalis 10 mm. longis; staminibus styloque tepalis brevioribus; ovario obscure cristato.

Typus: Traub no. 1088 (TRA), grown at La Jolla, Calif., 8-15-68, from bulbs collected by T. M. Howard 67-14, east of Durango City, Mex. Highway 40, roadside, in low wet pastures and ditches in heavy clay soil.

Allium ownbeyi Traub, *sp. nov.*, Plant Life 24: 139, 1958, *anglise,* et Plant Life 25: v. 1969. Bulbo ovoideo per fissuras verticales augmenti; foliis 5 vel 6 late canaliculatis dorsum 6—8-porcatum, porcis marginibusque foliorum minute denticulatis; umbella 7—13-flora; pedicellis 1—1.3 cm. longis; perigonio pallide lavendulo, tepalis patentibus 5—6 mm. longis; staminibus styloque tepalis brebioribus; ovario 6-cristato.

Typus: T. M. Howard, s. n. (= no. 1066 TRA), Nov. 1966, Nuevo Leon, Cerro del Obispado, within western edge of City of Monterrey.

Allium potosiense Traub, *sp. nov.*, Syn.— "Allium subteretefolium Traub" Plant Life 24: 141. 1968, *anglise.* Bulbo ovoideo per bulbas terminales in rhizomatibus horizontalibus augmenti; foliis 3 vel 4 anguste linearibus leviter canaliculatis interdum subteretibus usque ad 3—3.5 mm. latis; umbella 14- vel 15-flora laxa; pedicellis per anthesin 2—2.3 cm. longis; perigonio campanulato; tepalis albidis oblanceolatis 9 mm. longis carinatis, carina brunneo-lavendula; staminibus styloque tepalis parum brevioribus.

Typus: Traub no. 1089 (TRA), grown at La Jolla, Calif., 7-28-68, from bulbs collected by T. M. Howard 66-3A, n. City of San Luis Potosi, Mex.

AMARYLLIS EVANSIAE FORMA VIRESCENS

In February 1968, Mr. Alek Korsakoff sent in a specimen of a form of *Amaryllis evansiae* (Korsakoff No. 1416) with very light uranium green (HCC 63/3) flowers, and this is here described as a form of this species. Mr. Korsakoff is to be commended on singling out this form of *Amaryllis evansiae.* It is hoped that others will follow up this beginning by gathering together other green-flowered plants of this species. By intercrossing these green-flowered plants it will be possible to establish this trait so that the green-flowered form can be easily increased from seeds.

Amaryllis evansiae forma **virescens** Traub & Korsakoff, **forma nov.**

A forma typica floribus pallidissime uranio-viridibus differt.

Differs from the nomenifer (typical) form in the uranium green flowers. Holonomenifer (typus): Alek Korsakoff No. K 1416 (= No. 1091 TRA), Cult. Jacksonville, Fla., 2-10-68; paranomenifer: Alek Korsakoff No. K 1416A (= No. 1092 TRA), 5-15-68.

Cyrtanthus elatus (Jacq.) Traub, *comb. nov.* Syn.—*Amaryllis elata* Jacq. Hort. Schoen. 1: 32, pl. 62. 1797.

Cyrtanthus purpureus forma *magnificus* (Bak.) Traub, *comb. nov.* Syn.—*Vallota purpureus* var. *magnifica* Bak., Amaryll. 54. 1888; Fl. Cap. 6: 218. 1896.

Cyrtanthus purpureus forma *albus* Bak. ex Traub, *forma nov.* Descr.—Haec forma a forma typica speciei floribus albis recedit (typus). Cf. Bak., Amaryll. 54. 1888; Fl. Cap. 6: 218. 1896.

Subgenus *Vallota* (Herb.) Traub, *comb. nov.* Genus *Cyrtanthus* Ait. Syn.—*Vallota* Herb. App. Bot. Reg. 29. 1821.

Tristagma uniflorum f. *pauciflorum* Traub, *forma nov.*—(descr.) A forma typica speciei umbella 2—3-flora recedit (typus). Cf. Plant Life 23: 67. 1967.

Pancratium landesii Traub, *sp. nov.* (Amaryllidac.).—Foliis oblongis, parte inferiori angustatis; umbella uniflora; segmentis tepalorum linearibus acutis; poculo staminali segmentis tepalorum dimidio breviore. Fig. 14, Plant Life 24: 50. 1968, *typus.* Habitat: On coast near Salahah, Zufur Region, Sultanate of Muscat and Oman.

Tribus *Brodiaeeae* Traub, *tribus nov. (Amaryllidac.)* Perigonium regulare, inferne tubulosum, superne in segmentis 6 divisum, rhizoma cormosa pedicelli ad apicem saepe articulati. Typus: Genus *Brodiaea* J. E. Smith

Tribus *Milleae* Traub, *tribus nov. (Amaryllidac.)* Rhizoma cormosa; perigonium regulare; ovarium ad apicem gynophorii positum. Typus: Genus *Milla* Cav.

Subgenus *Oporanthus* (Herb.) Baker ex Traub, *comb. nov.,* ''Oporanthus'' Baker, in Amaryll. 28. 1888. Syn.—*Oporanthus* Herb. App. Bot. Reg. 38. 1821.

Subgenus *Imatophyllum* (Hook.) Bak. ex Traub, *subg. nov.,* ''Subg. Imatophyllum Bak.'' Amaryll. 61. 1888. Syn.—*Imatophyllum* Hook., Bot. Mag. 2856. 1828.

X *Brunserine* Traub, in Plant Life 17: 105. 1961, *anglise* et Plant Life 19: 59. 1963; Traub, Genera of Amaryll. 62. 1963. Syn.—

''Nerinodonna Messrs. van Tubergen,'' Gard. Chron. CLXII: 11. 1967. *anglise;* Amateur Gardening Oct. 28, 1967, p. 47, with figure, *anglise;* Popular Gardening, Oct. 23, 1967, p. 23, with figure, *anglise;* X *Amerine* Sealy, Jour. Roy. Hort. Soc. XCIII(10); 430-433. 1968.

X *Brunserine tubergenii* Traub, in Plant Life 19: 59. 1963. Syn.—''Nerinodonna tubergenii Messrs. van Tubergen'', Jour. Roy. Hort. Soc. XCIII(10): 430. 1968, *anglise;* X *Amerine tubergenii* Sealy, Jour. Roy. Hort. Soc. XCIII(10): 430-433. 1968; Beckett, Gard. Chron. Oct. 18, 1968, fig. p. 19.

In connection with X *Brunserine* and X *Brunserine tubergenii* above, it should be noted that *Rhododendron indicum* Sweet (*Ericaceae*) crossed with *R. mucronatum* Don and *R. simsii* Planch. gave rise to most of the group commonly known as the hybrid Indian azaleas. Similarly, in the *Cruciferae, Brassica neobrassica* Mill. (Rutabaga) crosses with *B. rapa* (Turnip) with fertile offspring. Such examples can be multiplied almost indefinitely in the Plant Kingdom, including various examples from the *Amaryllidaceae.*

Scientists are agreed that it would be *unrealistic* to separate out *Rhododendron indicum* and *Brassica rapa* as the types of two new genera respectively. Mr. Sealy surely will agree with these conclusions since there are also *no morphological characters of generic importance* to justify separation in each example cited.

In one of the examples from the *Amaryllidaceae,* the Cape Belladonna, *Brunsvigia rosea* (Lam.) Hann. crosses with some other *Brunsvigia* species such as *B. grandiflora* and *B. josephinae* with resulting fertile hybrids such as *B.* x *parkeri* W. Wats, ex Traub (see Traub & Hannibal, Plant Life 16: 39-62. 1960; Traub, Plant Life 25: 63. 1969).

Such hybrids were first made in Australia over a century ago, and more recently in Europe and the United States of America. There are now large populations of these hybrids in various generations from the original crosses, particularly in Australia and California where they are grown outdoors. As was the case with *Rhododendron indicum* and *Brassica rapa* crosses, the Cape Belladonna *cannot* be singled out as the type of a separate *unrealistic* genus as proposed by Sealy (see Jour. Roy. Hort. Soc. XCIII(10): 430-433. 1968) because it crosses with other *Brunsvigia* species with fertile offspring. In addition, the chromosome number as far as known is $2n=22$, and there are *no morphological characters of generic importance* to set it apart.

Surely, a scientist of Mr. Sealy's stature will agree with these facts. He apparently has not examined these plants in detail. When he does he will come to the same conclusion reached by other scientists and drop the *unrealistic* proposal to uphold the Cape Belladonna as the type of a separate genus from *Brunsvigia,* and will find it unnecessary to attempt to replace X *Brunserine* Traub (1963) with X *Amerine Sealy* (1968).

LECTONOMENIFER OF **ALLIUM GLANDULOSUM**

Under date of July 1, 1968, Prof. Th. Eckardt, Director, Botanischer Garten & Museum, Berlin-Dahlem, Germany, informed the writer that there is no specimen of *Allium glandulosum* Link & Otto in the herbarium of that institution.

Living stock of *A. glandulosum* was first collected by a Mr. Deppe in Mexico in 1826, near Mexico City, and illustrated by Otto & Link from plants grown at the Berlin-Dahlem Garden (1828-31). It is evident that if a specimen ever existed there, it was apparently lost during the last war. A lectonomenifer (lectotype) is therefore designated below.

Allium glandulosum Link & Otto, Ic. Pl. Rar. Berol. 1: pl. 17. 1828-31; Ownbey, Res. Stud. State Coll. Wash. 15: 224-225. 1947, in part; ibid. 18: 219-220. 1950, in part; Traub, Plant Life 23: 92-94. 1967.

Bulbs grown from stock collected by T. M. Howard (Howard No. 65-80) about 11 Km. (K277) n. of Jacala, Hidalgo, Mexico, July, in leaf, in corn fields, have been maintained at La Jolla, Calif.

For the lectonomenifer, bulbs (offsets from a single bulb) were planted singly in 6-inch pots, 6-24-67 at La Jolla, Calif., and harvested at three developmental stages: (a) 9-15-67 when in full bloom and rhizomes have begun to elongate; (b) when seeds were ripe in November 1967 and the rhizomes had elongated further; and (c) in late January 1968 when growth cycle was completed, as indicated by the death of the original bulb, and the presence of mature flowering-sized terminal bulbs on the rhizomes.

LECTONOMENIFER (lectotype): 1093a (TRA), 9-15-67. PARANOMENIFERS: to show the other two developmental stages, No. 1093b and 1093c (TRA) as indicated above.

SPECIES OF **SPREKELIA**

In the August 1968 (Part 8), Jour. Royal Hort. Soc., p. 335, L. S. Hannibal erroneously equates the dwarf *Sprekelia clintiae* (Plant Life 1965, p. 64) with *S. glauca Lindl.* (Bot. Reg. 26, p. 49. 1840). *Sprekelia clintiae* is quite distinct (as the description shows) from *S. glauca* which is a synonym of *S. formosissima* L.

THE CREST ON THE ALLIUM OVARY AND CAPSULE

HAMILTON P. TRAUB

In connection with the description of Mexican and Central American *Allium* species difficulties were experienced in characterizing the extremities of the ovary and capsule due to the inadequate definition of the term *crest*.

The term *crest* as defined at present in biology, particularly in phytology *(Plantae)* and zoology *(Animalia)*, is very uneven and inadequate.

It is worthwhile to take a glance at the definitions as they appear in a prominent general dictionary, and some dictionaries of biological terms. This will serve as a preliminary to arriving at an adequate definition.

According to Funk & Wagnalls (1930), *crest* is defined as (1) A comb or tuft on the head of a fowl. (2) The projection on top of a helmet; a plume or tuft. (3) A ridge of a wave or of a mountain; the top of anything. (4) A heraldic device; coat of arms. (5) Loftiness; pride; courage. (6) The ridge of the neck of a horse or dog. (7) Architecture: (a) The ridge of a roof. (b) Carved work or any continuous ornament on the ridge or other elevated parts of an edifice; a cresting.

Cooke (1873), dealing with plants and fungi, defined *crest* as ''having a ridge or crest''.

Gray ex Fernald (1950), dealing with higher plants, defines *crested* as ''bearing elevated ridges on projections on the surface, especially on petals, etc.''

Featherly (1954) defines *crested* as ''with elevated and irregular toothed ridge.''

Benson (1957), dealing with higher plants, defines *crested* as ''with a crest, that is, a projection at a prominent position such as the apex or midrib of an organ.''

Jaeger (1962), dealing with biology in general, mostly zoology, defines *crest* as ''the crest of a helmet, the plume; the tuft on the head of animals.''

It is readily apparent that the concept of the crest as applied to biology at present is inadequately defined. It is therefore necessary to formulate a comprehensive definition of the term *crest* as it applies to biology as a whole.

The term *crest* as applied in biology refers to the design, ridge, tuft, plume, or any projection at a prominent position on top of any part or organ of an organism (Traub, 1964), including *Acellulare* (viruses), and *Cellulare—Procaryotae* (bacteria and former blue green algae), and *Eucaryotae* (*Plantae, Heteroplantae* (fungi) and *Animalia*).

In the *Allium* L. ovary and capsule there are various kinds of crests ranging from designs through tufts, plumes and other kinds of projections. The crests on the ovary are usually not static but are subject to change as the ovary develops into the capsule. In some cases the design or projections on the ovary are barely recognizable, or even unrecognizable, in the mature capsule.

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CHROMOSOME NUMBER IN **LYCORIS "CINNABARINA"**

Nathan William Easterly

During the past year an undergraduate student, Thomas Bryan, and I have worked out the chromosome number of *Lycoris "cinnabarina"*. The growth of the plant is very similar to that of *Lycoris sanguinea*. William L. Hunt (Plant Life, 1963, page 51) refers to it as a variety of *L. sanguinea* and Sam Caldwell, (Plant Life, 1965, page 105), says that the plant may turn out to be *Lycoris kiushina*.

Mr. Bryan took microphotographs (x 1000) of root tip smears. Figures 12-A, 12-B and 12-C are three different shots of the same group of chromosomes. I made xerox copies of the prints, took a small pair of scissors to cut out the individual chromosomes, and lined up the chromosomes as seen in Figure 12-D. Later on, I made smears of two other plants of *Lycoris "cinnabarina"* and made sketches (x 1500) as seen in Figures 12-E and 12-F.

Mr. Bryan found 21 rod-shaped chromosomes and 1 V-shaped chromosome. He also found one B chromosome which would make the chromosome number $2n=22+1B$. From the xerox copies I did find the V-shaped one as shown in Figure 12-D. In the lower right corner of Figure 12-C, you will notice the median primary constriction. Another chromosome in Figure 12-C appears to have a median constriction, but these are two chromosomes that are overlapped. 16 of the rod-shaped chromosomes have sub-terminal constrictions.

Note in Figures 12-E and 12-F the chromosome which could be the V-shaped one (arrows) and a smaller fat chromosome (arrows). This smaller chromosome is shown at the lower right of Figure 12-D. I did not find the B chromosome to which Mr. Bryan refers. All 22 chromosomes were bivalent. Some of the sub-terminal constrictions were very clear in the aceto-carmine preparation, others were not.

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Bowling Green, Ohio 43402

SENDING LIVE AMARYLLID FLOWERS BY MAIL

Russell H. Manning,
Spring Valley, Minn. 55975

Difficulty had been experienced in sending specimens of live amaryllid flowers through the mails. Since others may also wish to send live flowers for identification by mail, the following method may be of general interest.

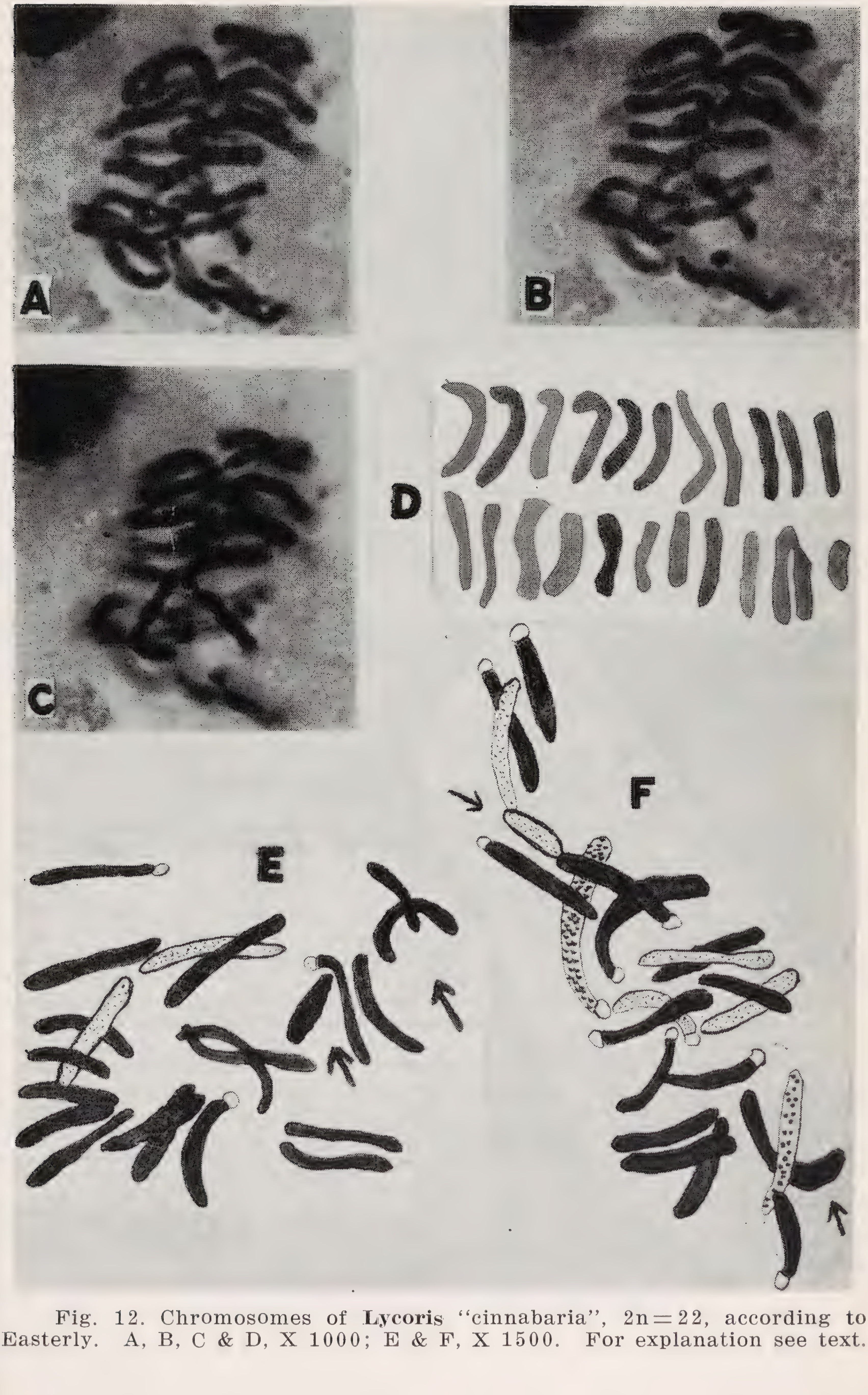

Fig. 12. Chromosomes of **Lycoris** "cinnabaria", 2n=22, according to Easterly. A, B, C & D, X 1000; E & F, X 1500. For explanation see text.

Formerly specimens were cut just prior to shipment, but mostly the flowers never arrived at their destination in good condition. The new method is as follows: the flower or flowers are cut and placed in a plastic bag *with one end open,* and left for 12 hours in an automatic defrosting refrigerator which gently picks up excess moisture. Thus there is less mushiness on reaching the destination. The usual precautions of wrapping paper table napkins around the bloom before packing in the plastic bag is still followed to help prevent crushing the fragile tepalsegs, and to act as a gentle sponge. Further, it was found that a too small container had been used. The bloom should be left as nearly as possible in the normal shape and with an ample supply of air for the journey. *With the help of air mail,* a bloom of a double *Crinum* (sugnenus *Codonocrinum*) finally reached its journey's end in California with even the perfume intact.

In the October 1959 *Begonian,* the writer saw in the Society's Seedfund column, an offering of seeds of *''Crinum powellii album''*. He obtained 5 seeds. All grew and some three years later they reached the flowering stage. As they flowered, it was noted that one plant produced semi- to double-flowered blooms *but only at random.* Having no source books except the copies of PLANT LIFE since 1965, he turned to Dr. Traub for help in checking out the plant, and a judgment about its uniqueness. Finally, the specimen arrived safely to demonstrate that double flowers do occur in *Crinum.* Others may wish to take note of their *Crinum* species and hybrids to study further the occurrence of flower doubling in the genus *Crinum.* Reports by others on double Crinums would be appreciated.

PLANT LIFE LIBRARY—continued from page 4.

WOODLAND NUGGETS OF GOLD, by Val Hardacre. Vantage Press, 120 W. 31st St., New York 1, N. Y. 1968. Pp. i—xii + 304. Illus. $4.95. Subtitled "The Story of American Ginseng Cultivation", this is mainly a rambling autobiographical account of the author's activities as a digger of Ginseng and Goldenseal in the wild, and the cultivation of ginseng. The story "is interwoven with family life and personal experiences. . . . It is a year-to-year account, arranged in chronological order, with allusions to the events taking place that were significant of those times." Cultural details of Ginseng culture are introduced incidentally. In addition he comments on the history of Ginseng and Goldenseal as an article of commerce from colonial times to the present day. Ginseng is a medicinal herb highly prized by the Chinese and other orientals. Two species are involved, **Panax quinquefolius** L. (Araliaceae), American Ginseng, which grows in rich and cool woods, from Que. to Man., s. to n. Fla., Ala., La., and Okla.; and **Panax schinseng** Nees, Asiatic Ginseng, native to Manchuria and Korea. These two species **are not related** to the garden Parsnip, **Pastinaca sativa** L. (Umbelliferae) as indicated in the text. Goldenseal, **Hydrastis canadensis** L. (Ranunculaceae), is native to rich woods from Vt. to Minn. & Nebr., s. to Ga., Ala., Ark. and (formerly) e. Kans. This is the only history of Ginseng and Goldenseal as American crop plants and the book is recommended to all who are interested in economic botany.

PLANT LIFE LIBRARY—continued on page 76.

CONTRIBUTIONS TO SOUTH AMERICAN AMARYLLIDACEAE—III.

PEDRO FELIX RAVENNA

I. SYNOPTIC TREATMENT OF THE GENUS **PHAEDRANASSA**

During several searching trips to the Andes, I had the opportunity of collecting a large quantity of bulbous plants. Among them were the species of **Phaedranassa.** One of these was the little known **Ph. dubia** (H.B.K.) Macbr., the other proved to be an undescribed species. The purpose of the present article is to present an up-to-date review of the genus.

Phaedranassa Herb.

Herbert, Edwards' Bot. Reg. 31: misc. p. 16. 1845.—Inflorescence few to many-flowered. Flowers pedicellate horizontal to pendulous, varying from yellowish green, pink, scarlet or red and green, more or less tubular throughout or slightly ampliated at the apex. Hypanthium absent. Tepals narrowly oblanceolate, rather connate at the base. Filaments free, filiform or connate toward the base into a membranous cup (subgenus Stricklandia) attached to the base of the free portion of tepals, filiform, of two or four different lengths. Anthers small oblong-reniform, versatile. Ovary ellipsoid obtusely trigonous; ovules many per cell. Style filiform equaling or surpassing the stamens. Stigma capitate or clavate-capitate. Capsule subglobose; rather tricoccous. Seeds flattened, often D-shaped, black, with membranous edges.

Bulb ovoid produced into a short neck. Leaves petioled, blade lanceolate or elliptic, acute. Scape cylindrical not fistulose. Spathe bivalved; valves marcescent papyraceous; inner bracts as many as the flowers. **Type-species: Ph. cloracra** Herb. = **Ph. dubia** (H.B.K.) Macbr. (Ecuador, Colombia).

Range.—Ecuador and Colombia to Costa Rica. Three species were reported by Macbride to Peru (see notes below).

Species recognized: Ph. carmioli, Ph. dubia, Ph. lehmanni, Ph. loxana, Ph. schyzantha, Ph. tunguraguae, Ph. viridiflora and **Ph. eucrosioides.**

Notes.—Three species were quoted by Macbride (1938) to Peru. With the probable exception of one locality datum, referred by this author to **Ph. viridiflora** ("Huancayo, on the way to the montana", Raimondi), the rest concerning the green-flowered species, must be associated with **Rauhia multiflora** (Kunth) Rav. A dissection of Raimondi's specimen (in SM) shows that this sheet is probably the only one which should be truly referred to the genus; due to its membranous staminal cup it should belong to the subgenus **Stricklandia.** Nevertheless a further study on this specimen is needed in order to identify it correctly.

The report of **Ph. carmioli** from Cusco (Peru) seems doubtful; it probably is a misidentification of some **Eustephia** species.

Systematic position of **Phaedranassa** and its allied genera

Due to the fact that our genus is closely related to **Rauhia,** and has an obvious similarity with **Stenomesson,** it is transferred to the tribe **Stenomesseae.** The scape is solid, and not hollow as was interpreted by Traub (1963). The same position is adopted with **Eucrosia** a genus allied to **Phaedranassa.**

The genus **Chlidanthus** has, in my opinion, a striking resemblance with **Castellanoa,** especially concerning the androecium. Moreover it has 20 somatic chromosomes, a quite unrelated number from those found in **Rauhia** (see Flory 1966) and other genera of the tribe **Stenomesseae.** For these reasons it is placed beside **Castellanoa,** within the tribe **Eustephiae,** as follows:

1a. Flowers red pendulous or sometimes cernuus, slightly zygomorphic .... **CASTELLANOA**
1b. Flowers yellow, upright to suberect, almost actinomorphic .... **CHLIDANTHUS**

Tribe **Stenomesseae**

1a. Leaves fleshy, almost coriaceous, folded outwards in outwards in prefoliation .... **RAUHIA**
1b. Leaves not fleshy, nor almost coriaceous, not folded outwards in prefoliation.
  2a. Staminal cup, if present, frequently narrow, more or less hidden by the tepals.
    3a. Flowers with a true hypanthium. Staminal cup always present .... **STENOMESSON**
    3b. Flowers lacking a true hypanthium. Filaments free or rarely connate toward the base into a membranous staminal cup.
      4a. Stamens moderately surpassing the perigone (not more than half of its length); its filaments straight .... **PHAEDRANASSA**
      4b. Stamens twice to five times the length of the perigone; its filaments often declinate-ascending .... **EUCROSIA**
  2b. Staminal cup very large, prominent, not hidden by the tepals. Stamens arising from the inner surface of the staminal cup, some distance below its edge .... **PARAMONGAIA**

Key to species of **Phaedranassa**

1a. Filaments free.
  2a. Flowers red more or less tinged with green.
    3a. Flowers green at the apex or, in one case, also at the concrescent part of tepals; the rest red.
      4a. Tepals somewhat spreading at their apex. Stamens much surpassing the perigone.
        5a. Concrescent portion of tepals green .... 1. **Ph. loxana**
        5b. Concrescent portion of tepals red.
          6a. Concrescent part of tepals funnel-shaped. Leaves dark green (at least in the adaxial face), not pruinose, with a short petiole .... 2. **Ph. carmioli**
          6b. Concrescent part of tepals, cup-shaped. Leaves not dark green, pruinose (at least in the wilds); petiole rather long .... 3. **Ph. dubia**
      4b. Tepals straight for all their length. Stamens scarcely surpassing the perigone .... 4. **Ph. tunguraguae**
    3b. Flowers red towards the apex; green only at the concrescent part of tepals.
      7a. Flower constricted at the end of the concrescent portion of tepals. Stamens exceeding the tepals for 12-13 mm. .... 5. **Ph. schizantha**
      7b. Stamens exceeding the tepals for 12-13 mm. Flowers constricted at the end of the concrescent portion of tepals .... 6. **Ph. lehmanni**
  2b. Flowers green, passing into whitish and greenish yellow towards the base .... 7. **Ph. viridiflora**
1b. Filaments connated towards the base into a membranous staminal cup .... 8. **Ph. eucrosioides**

Subgenus 1. **Phaedranassa**

Filaments free to the base. Staminal cup absent.

1. **Phaedranassa loxana** Rav. **nom. nov.**

Phaedranassa cloracra Lindley, Edwards' Bot. Reg. 31: tab. 16. 1845. Excl. syn. **Ph. cloracra** Herbert, 1.c: misc. p. 16. 1845.

Bulb nearly globose or broadly ovoid, about 6-6.5 cm. long, 6.4 cm. wide, with a short neck. Leaves oblanceolate, petioled, probably serotine, about 19 cm. long, 45 mm. broad; petiole relatively long; blade with crossing veinlets in the abaxial face. Scape cylindrical apparently pruinose about 7-8 mm. broad. Inflorescence about 12-flowered. Spathe marcescent papyraceous; inner bracts many narrowly lanceolate. Flowers nodding about 58-59 mm. long, 31-32 mm. in diameter at the apex, slightly constricted at the end of the concrescent portion of the tepals, which is green. Tepals oblanceolate about 44-52 mm. long, 75-95 mm. broad; a rose-red for 30-35 mm., upper third greenish with yellowish margins. Filaments biseriate, [the epipetal slightly longer, about 57-60 mm. long]; anthers reniform-oblong, yellow about 5-6 mm. long. Ovary obovoid or ellipsoid obtuse-trigonous, green. Style equaling the stamens or apparently slightly shorter; stigma capitate.

Hab.—Ecuador, region of Loja.

Phycella cloracra Herb. was a superfluous additional name for **Haemanthus dubius** H.B.K. (known at present as **Phaedranassa dubia**). Herbert includes **H. dubius** under synonymy of his species quoting the same locality data mentioned by Humboldt, Bonpland and Kunth. This fact obviously proves that **Phycella cloracra** was correctly referred by authors to **H. dubius** H.B.K. Furthermore when Herbert established **Phaedranassa** (Bot. Reg. 31: misc. p. 16, 1845), he repeats for **Ph. cloracra** (the type species) the synonymy and place of origin as under **Phycella cloracra** Herb. Thus, both names must be associated to the same plant.

In the same volume (under plate 17), Lindley reproduces Herbert's Latin descriptions for the name **Phaedranassa cloracra**. Unfortunately he gives the illustration of a related, but different species. This was found also in Ecuador, near Saraguro, a small town which belongs to the southernmost province of Loja. Actually, Lindley himself was approaching to the truth, when he stated: "Another species of **Phaedranassa** is the **Phycella obtusa** mentioned in the last volume of this work at no. 93 of the miscellaneous matter. It was also one of the discoveries of Mr. Hartweg, who collected it on the arid banks of the river Guallabamba, in the valley of San Antonio, in the province of Quito, at an elevation of about 7000 feet above the level of the sea. As this was the place where Humboldt and Bonpland found their **Haemanthus dubius**, it is not improbably that it is of **P. obtusa** rather than **cloracra** that this plant is a synonym". **Phycella obtusa** Herb. represents a further synonym for **Phaedranassa dubia** (H.B.K.) Macbr.

A question then arises: should we have considered Lindley's plant as a validly published species? The alternative lies in the fact that the new combination **Phaedranassa cloracra** (Herb.) Herb. and **Ph. cloracra** in the sense of Lindley, appeared in the same volume. We could have selected Lindley's article against Herbert's. By this way, the binomial **Ph. cloracra** should have been preserved for Lindley's plant, as published by this author. This statement however, even if possible, would not have helped in clearing up of our knowledge of the genus; moreover, much confusion would be added. It seemed better to accept **Ph. cloracra** (Herb.) Herb., as a validly published combination, even if it would be kept under synonymy of **Phaedranassa dubia** (H.B.K.) Macbr. Thus, a new name for Lindley's plant is necessary.

Having had the opportunity of seeing in the wilds a large number of plants of **Ph. dubia**, no doubts exist in my mind that **Ph. loxana** represents a distinct species.

2. **Phaedranassa carmioli** Bak.

Baker, Saunders' Ref. Bot. 1: tab. 46. 1869.

A native of Costa Rica where it was recently recollected (see Herbertia 1940). The leaves are very similar to those of **Ph. tunguraguae** Rav.

3. **Phaedranassa dubia** (H.B.K.) Macbr.

Macbride, Publ. Field Mus. Nat. Hist. Chicago, Bot. Ser. 11: 12. 1931; **Haemanthus dubius** H.B.K., Nov. Gen. Sp. Pl. 1: 281. 1816; **Crinum quitense** Sprengel, Linn. Syst. Veg. 2: 55. 1825; **Collania dubia** (H.B.K.) Roemer et Schultes, Linn. Syst. Veg. 7(2): LII. 1830; **Phycella obtusa** Herbert, Edwards' Bot. Reg. 30: misc. p. 93. 1844; **Phaedranassa cloracra** Herbert, Edwards' Bot. Reg. 31: misc. p. 16. 1845; **Ph. obtusa** (Herb.) Lindley, **loc. cit.** 31: sub tab. 17. 1845.

Plant about 40 cm. high. Bulb widely ovoid covered with brownish, more or less corrugated coats, these are often produced upwards in a somewhat long pseudoneck (at least in the wild); roots somewhat fleshy. Leaves none at flowering time, [hysteranthous], sometimes decumbent, distinctly petioled, about 30-40 cm. long, 50-65 mm. broad; petiole about 7-10 cm. long; blade oblanceolate, revolute in vernation, often pruinose in the adaxial face, paler and with a thick midrib in the abaxial face. Scape cylindrical, not fistulose, pruinose, about 40 cm. long, 7.5 mm. broad. Spathe 4-6-flowered, bivalved; valves lanceolate, subequal, at anthesis papyraceous; inner bracts linear. Flowers pendulous, about 50 mm. long, 18 mm. in diameter or sometimes less at the apex, bright red from the base to 33 mm., green or greenish upwards. Pedicels cylindrical about 15-20 cm. long. Tepals narrowly oblanceolate, concrescent for nearly 10 mm., permanently imbricate-contiguous for more than three quarters of their length, then somewhat spreading, the green portion paler at the margins; the outer about 42-43 mm. long, 7 mm. broad, the inner slightly shorter and broader, about 38 mm. long, 7.5 mm. broad. Filaments somewhat complanate especially downwards, 4-seriate, pinkish, the lower pair about 4.45 mm. long, intermediate single about 45 mm. long, next pair nearly 47 mm. long, the lower single about 49 mm. long. Anthers yellow, nearly reniform, versatile, about 3 mm. long. Ovary declined, ellipsoid, tricostate, green, about 8.2 mm. long, 3.8 mm. wide. Capsule subglobose, somewhat tricoccous. Seeds flattened, black, D-shaped, with membranous edges.

Hab.—Frequent from Quito province in Ecuador, to Pasto (Colombia). It grows often on slopes in a well drained soil. I have found it, sometimes associated with **Ennealophus** sp. **(Iridaceae)**, **Stenomesson aurantiacum** (H.B.K.) Herb., **Salvia** sp., **Erica** sp., and several small bushes.

Phaedranassa tunguraguae Rav., **sp. nov.** (Fig. 13)

Planta usque 64 cm. alta. Bulbus late ovatus ad 5.5-7 cm. longus circ. 4.5-5.8 cm. latus tunicis exterioribus fusco-ochraceis in collo perbrevi circ. 2.5 cm. longus productis. Folia usque tres autumnali-vernalia prefoliationis revoluta ad anthesin absens petiolata ad 29-40 cm. longa circ. 53-80 mm. vel ultra lata; lamina fusco-viridia subnitida lanceolata vel oblanceolata; petiolus ad 6-9 cm. longus. Scapus teres efistulosus usque 54 cm. longus, prope basin usque 12.3 mm. latus, ad apicem circ. 6.8 mm. latus, pruinosus. Spatha 6-8-flora vivalvata, valvae valde inaequales circ. 3.8-4.2 mm. longae marcescentes papyraceae ad anthesin reflexae; bracteae interiores plures angustissime lanceolatae vel sublineares. Pedicelli ad 12-40 mm. longi. Flores declinati haud penduli ad 4 cm. longi ad basin veram viridi deinde circ. 26 mm. rubro-corallini, ad apicem viridi. Tepala anguste oblanceolata ad basin circ. 3.5 mm. connata subrecta inter se imbricato-con-

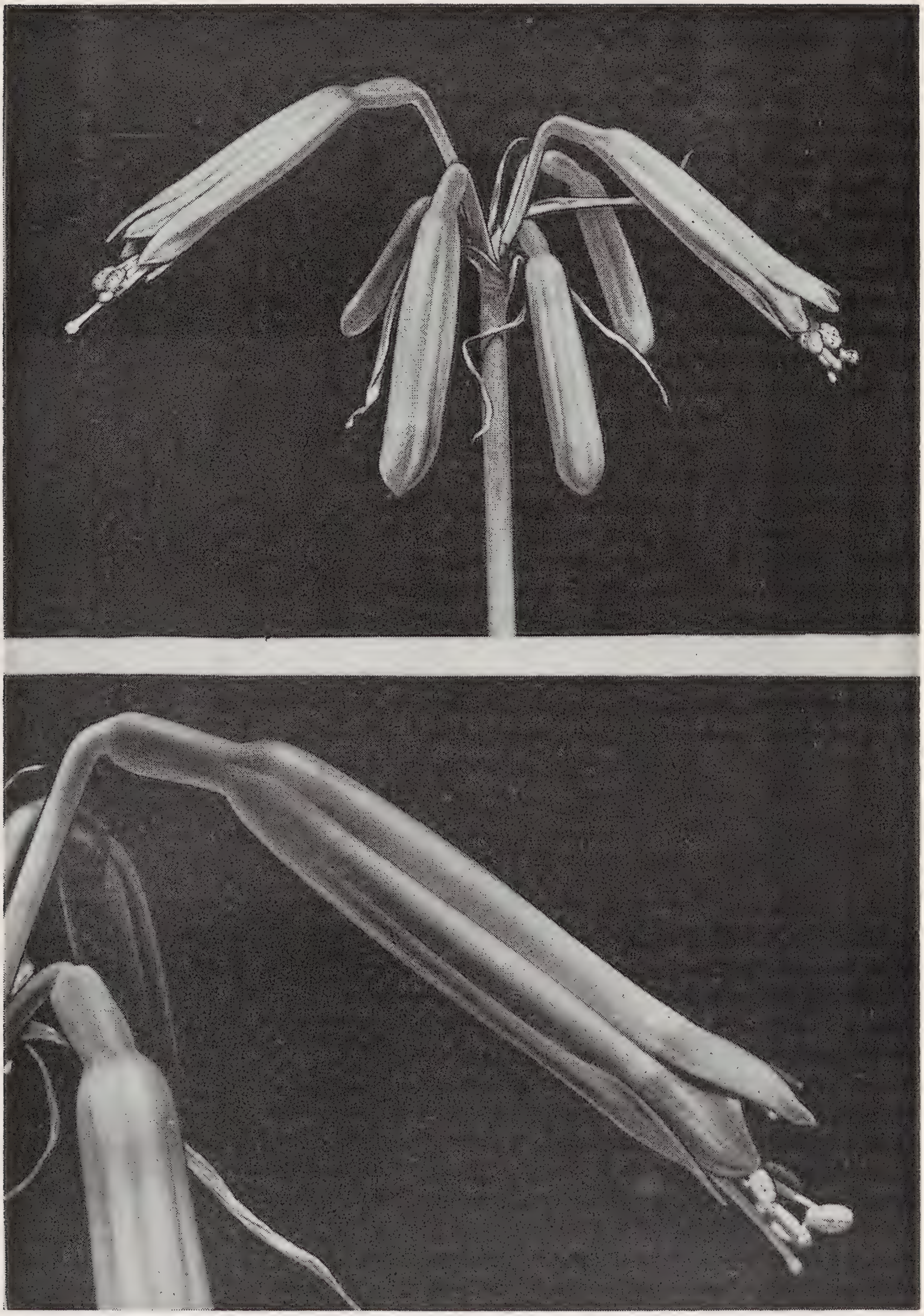

Fig. 13. **Phaedranassa tunguraguae** Rav., **sp. nov.**, native to Ecuador. Photo by P. F. Ravenna.

tigua ad 32 mm. longa circ. 4 mm. lata, exteriora perbreviter apiculata, interiora leviter minora acuta. Filamenta ad basin partii libera tepalorum insaet filiformia alba stricte fasciculata tepalas breviter superantia, 4-seriata Antherae aellypticae ad 1.8-1.9 mm. longae, pollen luteus. Ovarium subaellypticum obtuse triqetrum pruinosus ad 6 mm. longum circ. 3 mm. latum. Stylus filiformis ad 38-43 mm. longus; stigma capitatus. Capsula matura seminaque non vidi.

Hab.—In decliviis abruptis supra fluminem Pastaza prope Baños (locis Spruceanis) prov. Tunguraguae Equatorii. Crescit prope **Anthericum glaucum** Ruiz et Pav., **Ennealophus** sp. **(Iridaceae)**, **Coursetia** cfr. **fruticosa** (Cav.) Macbr. **(Leguminosae)**, **Vicia** cfr. **andicola** Kth. (Ley.) Bromeliaceae et caet. Culte in horto meo.

Plant about 54 cm. high. Bulb widely ovate about 5.5 cm. long, 4.5-5, 8 cm. wide; outer coats brownish produced into a very short (about 2.5 cm. long) pseudoneck. Leaves not more than three, from autumn to the beginning of spring, revolute in vernation, not developed at the flowering time, petioled, about 29-40 cm. long, 53-80 mm. broad; petiole about 6-9 cm. long; blade lanceolate or oblanceolate, dark green, slightly shining, paler on the abaxial face. Scape cylindrical, solid, about 54 cm. long, 10-12, 3 mm. wide near the base, 6 mm. near the apex, pruinose. Spathe bivalved 6-8-flowers; valves marcescent, papyraceous at anthesis; inner bracts several, very narrowly lanceolate to nearly linear. Pedicels about 12-40 mm. long. Flowers declined, not nodding, about 4 mm. long, green in the very base, coral-red for 26 mm., green toward the apex. Tepals narrowly oblanceolate, about 32 mm. long, 4 mm. broad, connate at the base for 3.5 mm., nearly straight, imbricate-contiguous for 23 mm., outer shortly apiculate, inner slightly shorter, acute. Filaments attached to the base of the free portion of the tepals, filiform, white, closely fasciculate, of four different lengths, somewhat longer than the tepals. Anthers elliptical about 1.8-1, 9 mm. long; pollen yellow. Ovary nearly elliptical obtusely trigonous, about 6 mm. long, 3 mm. wide. Style filiform about 38-43 mm. long; stigma capitae. Mature capsule and seeds not seen.

Hab.—In rugged slopes above the river Pastaza, near Baños, prov. of Tunguragua, Ecuador. It grows near **Anthericum glaucum** Ruiz & Pav., **Ennealophus** sp. **(Iridaceae)**, **Coursetia** cfr. **fruticosa** (Cav.) Macbr., (Leguminoses), **Vicia** cfr. **andicola** Kth. (Legum.), Bromoliads and others. Cultivated in my collection at Buenos Aires.

Specimens.—Cultivated at Buenos Aires from bulbs collected in the above mentioned region; leg. Ravenna 373, nov. 1965. (type in Herb. Ravennae).

This species seems to be an endemic of the Baños region, in Ecuador. It was found by me, in the vegetative state, in the same places which were intensively explored by R. Spruce during 1857. Our plant is quite rare and it grows practically concealed by bushes. Thus it is not surprising that the famous English botanist had not found it.

The bulbs were introduced to my collection of living plants. One of them flowered for the first time in 1965. In the following years I have seen flowers twice. The plants seem to be well established in pots. They have to be kept nearly dry when they give flowers and have no leaves.

5. **Phaedranassa schyzantha** Bak.

Baker, Gard. Chron. n. ser., 14(2): 556. 1880

The flowers of this species were described by Baker (1888) as: "Perianth limb 1½ in. long; tube campanulate green 1/6 in. long; segments lanceolate, bright red, with a salmon coloured obtuse tip ¼ in. broad.

Hab.—Andes of Colombia ("Ecuador" according to Baker), Pasto, about 3200 m. Discovered by André in 1876.

6. **Phaedranassa lehmanni** Reg.

Regel. Gartenfl. 32: 354, tab. 1138. 1883.

Possibly not specifically distinct from **Ph. schyzantha.** The only character which doubtfully separates both taxa is the length of stamens and style. The geographical range of both seems to be practically coincident or at least not very distinct.

Hab.—Columbia, western slopes of the Andes, at an elevation of about 2200 m. Introduced by Lehmann.

7. **Phaedranassa viridiflora** Bak.

Baker, Gard. Chron. n. ser. 8(2): 134. 1877.

According to Baker this could be a colour-variety of **Ph. dubia.** In my opinion it seems to be a good species.

Hab.—Andes of Ecuador. Described from living specimens sent by Mr. H. J. Elwes in June 1877, and Mr. Wilson Saunders.

Subgenus 2. **Stricklandia** (Bak.) Rav. **comb. nov.**

Genus **Stricklandia** Baker, Handb. Amaryll.: 105. 1888.

Filaments united in the lower half forming a staminal cup.
Type-species: Ph. eucrosioides (Bak.) Rav.

8. **Phaedranassa eucrosioides** (Bak.) Benth. & Hook.

Gen. Pl. 3(2): 733. 1833; **Stricklandia eucrosioides** (Herb.) Bak. Amaryll. 105. 1888; **Leperiza eucrosioides** Bak., Gard. Chron. 1(1878) 170; **Stenomesson stricklandii** Bak. loc. cit. 2 (1882) 102.

It does not seem necessary to repeat here Baker's description. According to this author, **Stricklandia** differs from Phaedranassa merely in its filaments united into a staminal cup in the lower half. Excepting this character, it is similar in every respect to the latter genus. Therefore I have reduced it to subgeneric rank. Apparently there exists a second species of this subgenus in Peru.

Excluded or doubtful species

Rauhia multiflora (Kth.) Rav., **comb. nov.**

Phaedranassa multiflora Kunth, Enum. Pl. 5: 502. 1850; **Ph. megistophylla** Kraenzlin, Engler Bot. Jahrb. 54, Beibl. 17: 2. 1916; **Rauhia peruviana** Traub, Pl. Life 13: 73. 1957; **Rauhia megistophylla** (Kraenzl.) Traub, Pl. Life 22: 5. 1966; Ravenna, Sellowia 19: 33. 1967.

In the first series of these notes (Ravenna, 1967), **Phaedranassa megistophylla** Kraenzl. was recognized as belonging to the genus **Rauhia.** Consequently, the combination **Rauhia megistophylla** (syn. **R. peruviana** Traub) was made. The same conclusion was reached by Traub a year before (see Traub 1966), but due to an oversight, his article was not detected.

Recently however, **Ph. multiflora** Kth. a much earlier binominal was found for the same species. The geographic range given by Kunth was "Colasey, Prov. Jaen de Bracamoros". No further reports of country as to habitat were quoted. In spite of this omission, the place was detected by me as belonging to Peru. Therefore, the complete data for the species must be: Peru, Dept. Cajamarca, prov. de Jaén (or "J. de Bracamoros"), Colasay (not "Colasey"). As can be seen, it belongs to the very same region where the other populations were found. Vernacular names are: "puccra" and "oreja de burro". Chromosomes: 2n=46 (Flory, W. S. Plant Life 22: 52-55. 1966).

"? Phaedranassa vitellina Roezl. ex Wallace" **nomen subnudum.**

Wallace, Gard. Chron. ser. III, 83: 47. 1928. The author of this provisional name, and therefore illegitimate, writes as following: "A new species, probably a **Stenomesson,** described [verbally] as having brilliant orange-scarlet flowers". Collected in Ecuador, this should be associated with **Stenomesson aurantiacum** (H.B.K.) Herb.

"? Phaedranassa ventricosa Roezl. ex Wallace", **nomen subnudum.**

Wallace, loc. cit.: 47. 1928. Concerning this plant, its author says: "has a fine head of bright scarlet flowers very ventricose, with yellow protrudin antlers". Probably it should be referred to **Urceolina** peruviana, or to some allied species. It was found in Peru.

Phaedranassa rubroviridis Bak.

Baker, Gard. Chron. n. ser. 4(2): 7. 1875.

According to Baker (1888), this a synonym of **Eustephia coccinea** Cav.

II. STUDIES IN THE GENUS **GRIFFINIA**

During several collecting trips in Brazil, some species of this genus were found. They were cultivated in Buenos Aires, and their characters were studied and compared with those in other genera.

From a number of seven species gathered, three proved to be new to science, but only two flowered so as to permit descriptions and photographs. The third, a very rare native of southern Maranhao, was lost without flowering.

Invalidity of the genus **Hyline**

The genus **Hyline** was founded by Herbert (1841) who based it on a single species: **Hyline gardneriana** Herb.; this one automatically became the type.

It is of importance to repeat here Herbert's description of the androecium: **"filamenta cum stylo tenuia".** Nothing was said about a staminal cup. Moreover, in a foonote he states: **"Genus a Crino affine".** These points were confirmed by me on living plants recently collected, which were identified by comparison with a photograph of the type-specimen (at Kew). The latter consists of a single scape with flowers and two leaves. Therefore it is difficult to understand how Baker (1888) could have misinterpreted the nature of the androecium, describing it as "filaments very long united in a short cup at the base". Possibly he was influenced by the long narrow tepals, which resemble those of the **Hymenocallis** species.

On the other hand, on Gardner's label of collection is written: "These two withered specimens are all that I have been able to find. The flowers are white and must be very large. I sent plenty of bulbs to Mr. Murray. The bulb is used here as an emetico-purgative medicine in pectoral complaints". In the first line he was evidently referring to the poor and rather squashed specimen. This circumstance is excusable if we consider that the flowers expand late in the evening and last only one night. The flowers were surely decayed when the scape was taken probably in the morning.

Fifty eight years later, and as a consequence of Baker's mistake, the species was redescribed as **Hyline worsleyi** Mallet. Its author says: "The general aspect of the flower is that of **Griffinia**". In fact his opinion was correct, nevertheless in the 1936 edition of Herbertia, Worsley claims against Mallet's remark: "This cannot be substantiated", he says. Worsley was evidently following Baker in considering our plant as belonging to a genus related to **Hymenocallis,** a statement which as we have seen, is not accepted here.

Actually, the flower shows such characters as to justify a subgenus within the genus **Griffinia:**

Subgenus **Hyline** (Herb.) Rav. **comb. nov.** (within the genus **Griffinia** Ker-Gawl.); Genus **Hyline** Herbert, Curtis' Bot. Mag. 66: sub tab. 3779. 1841. **Type-species: Griffinia gardneriana** (Herb.) Rav.

Differs from subgenus **Griffinia**, by having nocturnal flowers, with long narrow tepals, all six stamens closely fascicled, declined, and many ovules per cell in the ovary.

Two species from Brazil: **G. gardneriana** (Herb.) Rav., a native of the States of Ceará, Pernambuco and Piauí, and **G. nocturna** Rav. from southern Goiás.

1a. Hypanthium absent or obsolete. Leaves nearly sessile or very shortly petioled, lorate or narrowly oblanceolate, nearly flat, closely prostrate on the ground (at least in the wilds) ....**C. gardneriana**

1b. Hypanthium well developed. Leaves petioled, broadly oblanceolate, rather canaliculate, not prostrate ....**G. nocturna**

Griffinia gardneriana (Herb.) Rav., **comb. nov.; Hyline gardneriana** Herbert, Curtis' Bot. Mag. 66: sub tab. 3779. 1841; **Hyline worsleyi** Mallet, Gard. Chron. ser. III, 26: 102. 1899.

Plant about 30-47 cm. high. Bulb widely ovate, about 45-70 mm. wide, covered with whitish or pale ochraceous coats; the pseudoneck always present, elongated, to 15 cm. long. Leaves lorate to oblanceolate, sessile or with a short petiole, always prostrate in nature, about 12-48 cm. long, 25-45 mm. broad, often with grayish areas in the adaxial face. Scape edged, about 20-36 cm. long. Spathe 2-3-flowered, bivalved; valves membranaceous, free down to the base. Pedicels about 19-32 mm. long. Flowers white, nocturnal, scented, about 12-15 cm. in diameter. Tepals linear-oblanceolate, subequal, about 15-18 cm. long, 13-16 mm. broad, the outer lateral and inner ones recurved. Stamens long, declined, all six fascicled, its filaments of four different lengths. Anthers linear-oblong, versatile, yellow, about 6-10 mm. long. Style white, about 15.7 cm. long; stigma punctate. Chromosomes: $2n=20$ (Mookerjea, 1955) see Traub (1963).

Hab.—It grows in sandy soil under deciduous woods. Quite common in the "caatingas" of southern Ceará, Piauí and southwestern Pernambuco. The bulb is used by natives as hemetico-purgative. Vernacular name: "cebola braba".

Specimens.—Brazil, Ceará, dry woods; leg. Gardner 1854, oct. 1838 (phototype from K).

Griffinia nocturna Rav., **sp. nov.** (Figs. 14 and 15)

Planta circ. 35 cm. alta. Bulbus ovato-globosus vel deppresso-globosus usque 7 cm. latus in collo productus, tunicis exterioribus albiusculis vel ochraceis vestitus. Folio usque quinque oblanceolata, valde petiolata longitudinaliter canaliculata ad margines revoluta usque 40-50 cm. longa circ. 7 cm. lata. Scapus 14-35 cm. longus circ. 10-12 cm. latus compressus. Spatha bivalvata 3-4-flora; valvae albiusculae vel viridiscentes lanceolatae ad apicem attenuatae valde carinatae et translucidae ad 50-66 mm. longae; bracteae interiores 2-3 anguste lanceolatae. Flores cernui albi ad 11-15 cm. longi horizontaliter usque 11 cm. latus, verticaliter circ. 10 cm. latus. Pedicelli crassi ad 3 cm. longi circ. 5.5 cm. lati vel nulli. Hypanthium subbrectus vel valde curvatus viridescens circ. 50 mm. longum. Tepala angustissima lineari-oblanceolata, exteriora ad 9 cm. longa usque 13 mm. lata, ad margines valde undulata, ad carinam viridescentia, apicem versus arcte recurvata (praecipue superius) apiculata (apiculus arc 4.7 mm. longus), interiori-lateralia ad 8.7 cm. longus circ. 10-12 mm. lata acuta valde recurvata. Filamenta alba fasciculato-declinata, sepalinum superiore ad 83 mm. longum, sepalina colateralia ad 88 mm. longa, petalinum inferiore circ. 72 mm. longum, petalina colateralia circ. 75. Anterae versatiles oblongolineares leviter arquatae ad 7.7 mm. longae; pollen luteus. Ovarium aellypticum obtuso-triquetrum pallide viride ovula biseriata 10-12 per loculum ad 8-12 mm. longum circ. 6.7-8.5 mm. latum. Stylus albus declinato-ascendens ad 15 cm. longus; stigma punctato-capitatus.

Hab.—In nemoribus hemideciduis vel deciduis collibusque prope urbem Goias, civit Goiás Brasiliae. Crescit prope **Trimezia lutea** (Kl.) R. C. Fost., ssp., **Alstroemeria** sp. **Aristolochia** sp. (suffrutex erectus floribus luteis concoloribus instructus), Commelinaceae, Euphorbiaceae urticantes, raro pr. **Bomarea** sp.

Plant about 35 cm. high. Bulb ovoid-globose or globose-depressed to 7 cm. wide, produced upward into a pseudo-neck; outer coats whitish or ochraceous. Leaves about five, oblanceolate, distinctly petiolate, chanelled, with slightly revolute margins, about 40-50 cm. long, 7 cm. wide. Scape compressed about 14-35 cm. long, 10-12 mm. broad. Spathe bivalved 3-4 flowered; valves whitish or greenish lancelate, attenuate towards the apex, rather carinate, hyaline about 50-66 mm. long; inner bracts 2-3 narrowly, lanceolate. Flowers cernuus white, nocturnal, scented, about 11-15 cm. long, 11 cm. in its horizontal diameter, 10 cm. in its vertical diameter. Pedicels thick, about 3 mm. long and 5.5 cm. broad, or obsolete. Hypanthium nearly straight or rather curved, greenish, about 50 mm. long. Tepals very narrow linear-oblanceolate, the outer 9 cm. long, 13 mm. broad, with rather undulate margins and a greenish-cream, markedly recurvate towards the apex (especially the upper), apiculate (apiculus about 4.7 mm. long), inner-lateral about 8.7 cm. long, 10-12 mm. broad, acute, rather recurvate. Filaments white, declined, fascicled, the upper episepal about 83 mm. long, both lateral episepals about 88 mm. long, lower epipetal about 72 mm. long; both

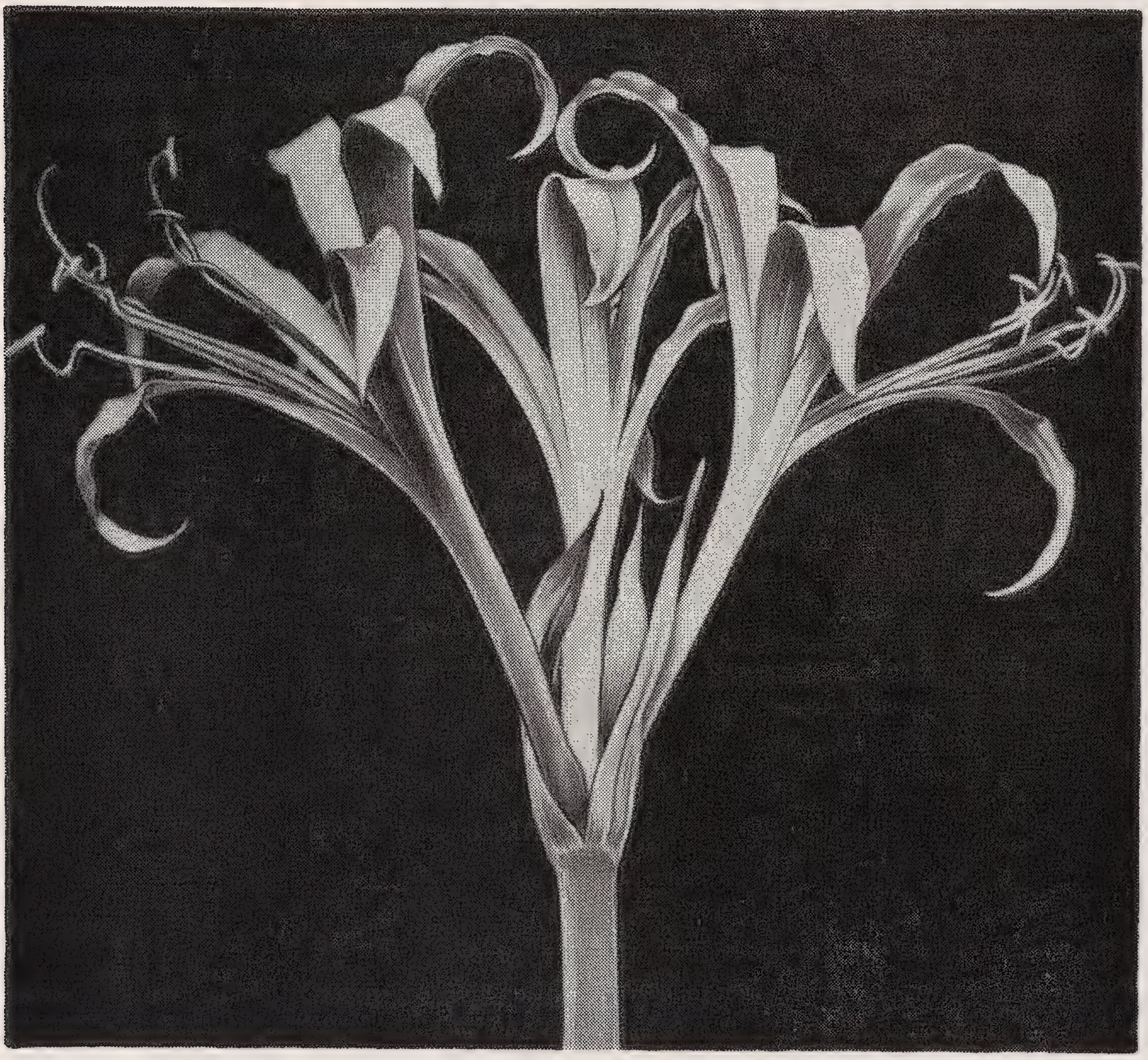

Fig. 14. **Griffinia nocturna** Rav., **sp. nov.,** native to Goiás, Brasil. Inflorescence. Photo by S. Magno.

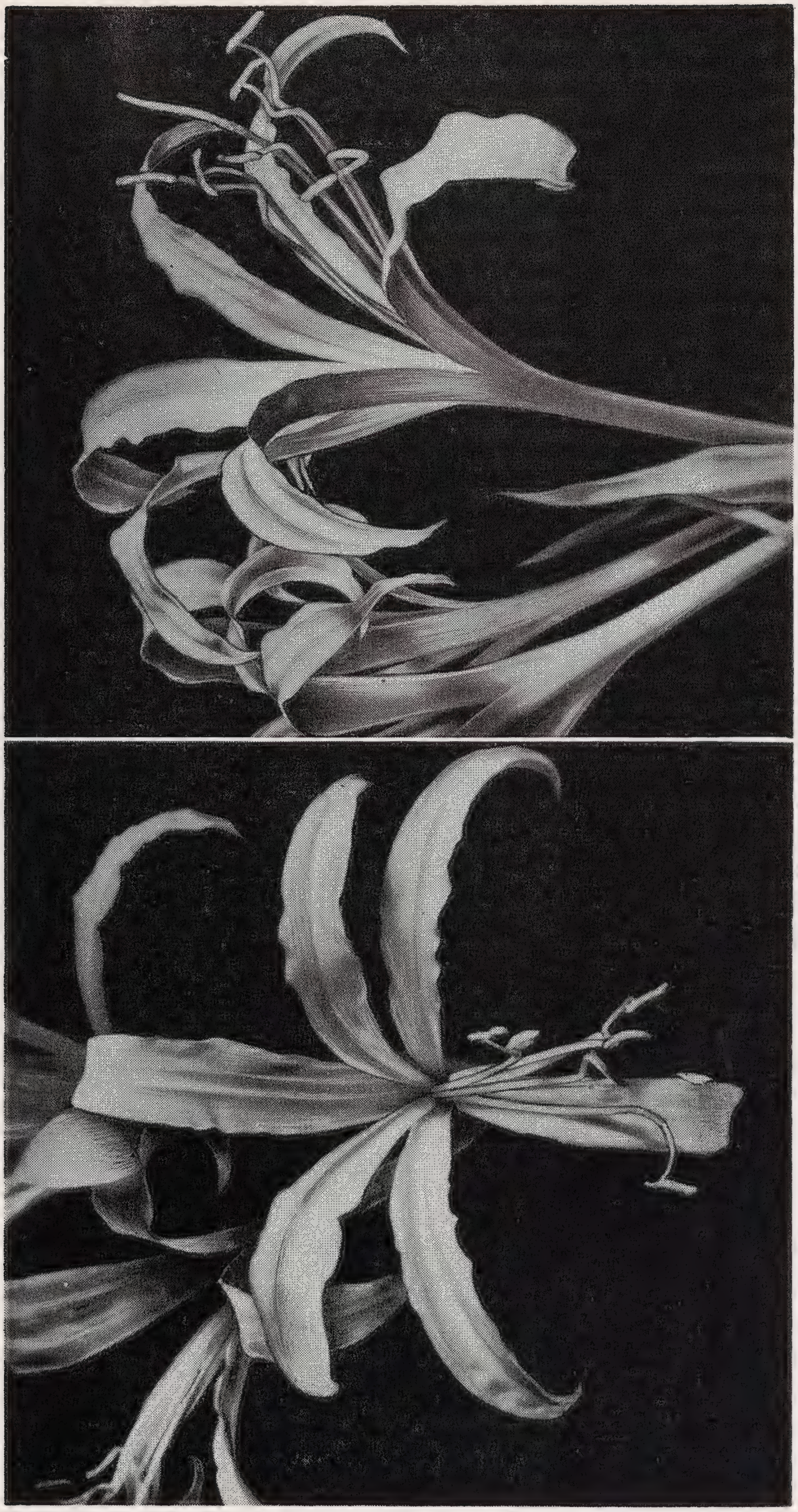

Fig. 15. **Griffinia nocturna** Rav., **sp. nov.**, native to Goiás, Brasil. Flower, front view (left) and side view (right). Photos by S. Magno.

lateral epipetals about 75 mm. Anthers versatile, linear-oblong slightly curved, about 7.7 mm. long; pollen yellow. Ovary ellipsoid obtusely trigonous, pale green, about 8-12 mm. long; 6.7-8.5 mm. wide; ovules biseriate, 10-12 per cell. Style declinate-ascending, about 15 cm. long. Stigma punctate-capitate.

Hab.—Deciduous or semideciduous woodland on hills, near the town of Goiás in the State of Goiás, Brazil. It grows near **Trimezia lutea** (Kl.) Fost. ssp., **Alstroemeria** sp, **Aristolochia** sp. (a small shrub with yellowish unspotted flowers), Commelinaceae, Euphorbiaceae, rarely also near **Bomarea** sp.

Specimens.—Cultivated in Buenos Aires from a bulb collected in the above mentioned region; leg. Ravenna 531, April 1966 (type in Herb. Ravennae).

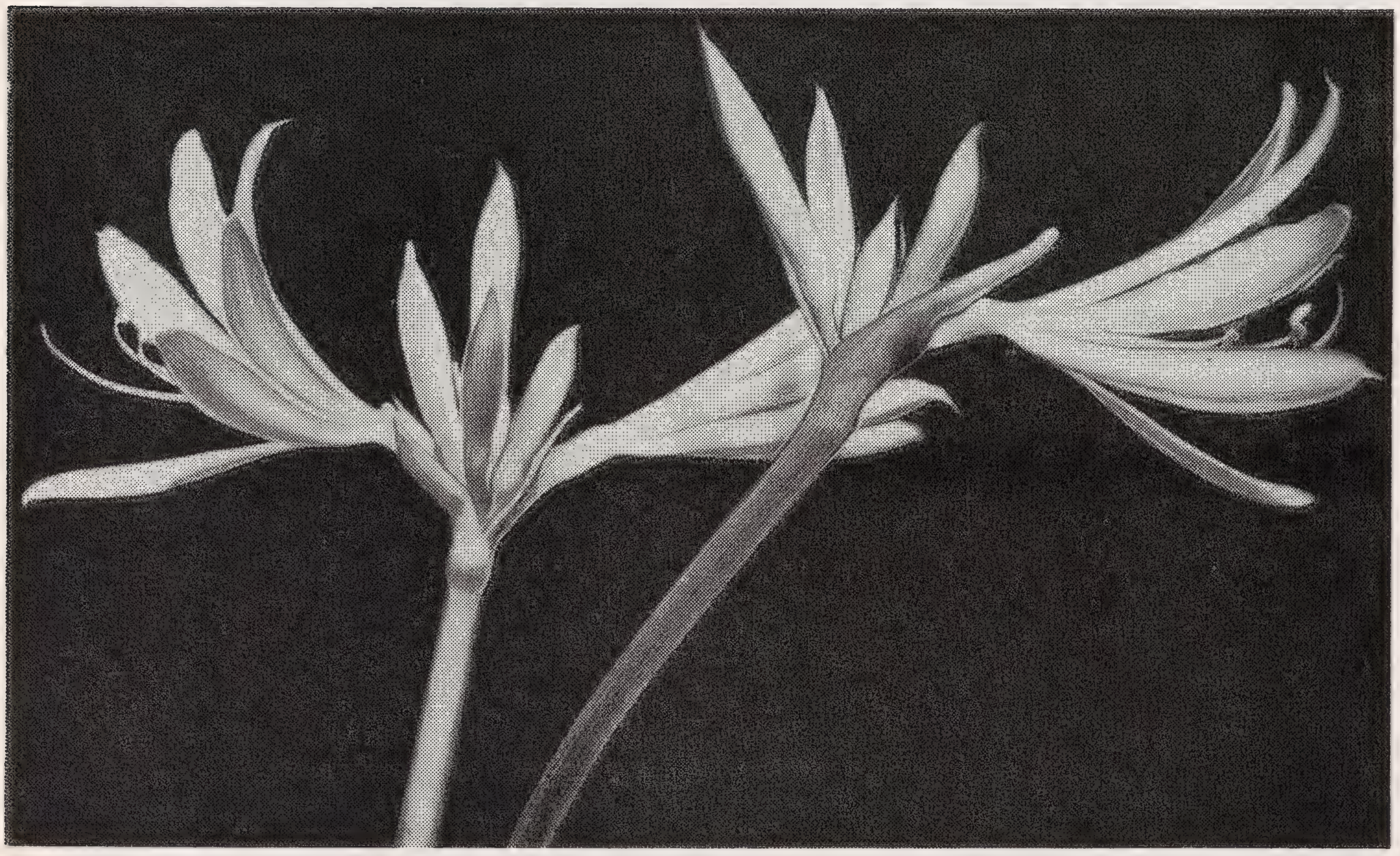

Fig. 16. **Griffinia espiritensis** Rav., sp. nov., native to Espirito Santo, Brasil. Inflorescences. Photo by P. F. Ravenna.

Bulbs of this handsome species were gathered by me in Goiás during the summer of 1966; at that time no flowers were found. Bulbs were carried to Buenos Aires and introduced to my collection. One plant flowered nearly one month later, a second which served for photographs, in the next spring. The scented flowers open at half past seven and they decay early the next morning, as follows: the first two or three simultaneously, the latter about two days later.

The small town of Goiás, the old capital of the State, was an obvious center for botanists of the last century, as Gardner, Saint Hilaire, Glaziou, and others which were going to collect in central Brazil. Therefore, it seems to me unexplicable, how they could have missed our plant, which is abundant a half kilometer or less, from the center of the town. Even if not in flower, bulbs should have been sent, with many others, to Europe for cultivation.

Crinum stapfianum Kraenzl. also a native of the State of Goiás, differs from our species by its long pedicels (to 6 cm.). Apparently, it was correctly classified in that genus.

A new species of the subgenus **Griffinia**

Griffinia espiritensis Rav., **sp. nov.** (Figs. 16 and 17)

Bulbus subglobosus circ. 5 cm. vel infra latus extus albiusculus vel pallide ochraceus in collo productus. Folia longe petiolata (petiolus erectus circ. 15-20 cm. longus); lamina subaelyptica vel late lanceolata subpatentia, acuta fusco-viridia, interdum obscure maculata sf 12-15 cm. longa circ. 7-8 cm. lata. Scapus teres sed leviter bimarginatus, ochraceo-rubellus, ad 25-75 mm. longus circ. 4.5 mm. latus. Spatha bivalvata 5-6-flora, valvae late lanceolatae basin versus connatae membranaceae translucidae integrae ad 16-22 mm. longae circ. 6-9 mm. latae. Flores pedicellati albiusculi et pallide lilacini ad 3.1 cm. longi horizontaliter circ. 3 an lati verticaliter circ. 3.2 cm. lati. Pedicelli pallide virides tereti ad 10.5 mm. longi. Tepara ad basin circ. 2.3 mm. concrescentia anguste oblanceolata, exteriori-lateralia paullo arquata ad 3.15 cm. long circ. 5 mm. lata apiculata (apiculus circ. 25 mm. long), exteriori-superius ad 3.3 cm. longum circ. 6.3 mm. lata apiculatum; ad basin apiculi minute tuberculata; interiori-lateralia ad exteriori-superius approximata usque 2.95 cm. longa circ. 6.4 mm. lata, leviter arquata, interiori-inferius declinato-horizontale ad 3 cm. longum circ. 4.2-5.4 mm. lata. Stamina fertilia sex; filamenta albiuscula, sepalinum-superius ad tepalum exteriori-superius approximatum circ. 23 mm. longum, caetera declinata, sepalina lateralia ad 24.5 mm. longa, petalina lateralia ad 19 mm. longa, petalinum-inferius circ. 18 mm. long. Antherae oblongo-reniformes ad 1.9-2.4 mm. longae, pollen cinereo-ochraceus.

Hab.—In sylvis civitatii Espiritu-Santo Brasiliae.

Bulb subglobose about 5 cm. or less wide, whitish or slightly ochraceous, produced into a pseudoneck. Leaves long petioled (petiole erect about 15-20 cm. long); blade nearly spreding, elliptical or broadly lanceolate acute, dark green sometimes obscurely maculated about 12-15 cm. long, 7-8 cm. broad. Scape cylindrical but with two slight margins, ochraceous to rufescent, about 25-75 mm. long, 4.5 mm. broad. Spathe bivalved 5-6-flowered; valves broadly lanceolate connate toward the base, membranous, somewhat hyaline, entire, about 16-22 mm. long, 6-9 mm. broad. Flowers pedicellated whitish and of a pale lilac about 3.1 cm. long, 3 cm. in its horizontal diameter, 3.2 cm. in its vertical diameter. Pedicels of a pale green, cylindrical, about 10.5 mm. long. Tepals connate for 2.3 mm. narrowly oblanceolate, outer-lateral somewhat arched about 3.15 cm. long, 5 mm. broad, apiculate (apiculus about 2.5 mm. long), the upper outer about 3.3 cm. long, 63 mm. broad also apiculate, at the base of the apiculus with a minute tubercle; both inner lateral approximate to the upper outer tepal, about 2.95 cm. long, 6.4 mm. broad, slightly arched, the lower inner declined to horizontal about 3 cm. long, 4.2-5.4 mm. wide. Stamens six all fertile; filaments whitish, the upper episepal approaching to the upper outer tepal about 23 mm. long, the rest declined, the lateral episepal about 24.5 mm. long, lateral epipetal about 19 mm. long, lower epipetal about 18 mm. long. Anthers reniform-oblong about 1.9-2.4 mm. long; pollen of a grayish-ochre colour.

Hab.—In woods of the State of Espiritu Santo, Brazil. It grows near **Neomarica** sp. (Iridaceae) and various Commelinaceae and Marantaceae.

Specimens: Cultivated in Buenos Aires from bulbs collected near the Sooretama Biological Reserve, on the way to the water-fall, State of Espiritu Santo, Brazil, leg. Ravenna 399, dec. 1965 (type in Herb. Ravennae). Brazil, Espiritu Santo, mun. Nova Venecia, Serra de Cima; leg. A. P. Duarte 3621, & J. C. Gomes 435, 16-XI-1953 (RB).

This very interesting species has the longest petioles in the genus. The shape of the flowers much resemble those of **G. rochae,** which bear only five stamens. It is somewhat related also to **G. ornata** T. Moore. This one however is a much more robust plant with shorter petioles and longer oblanceolate blades.

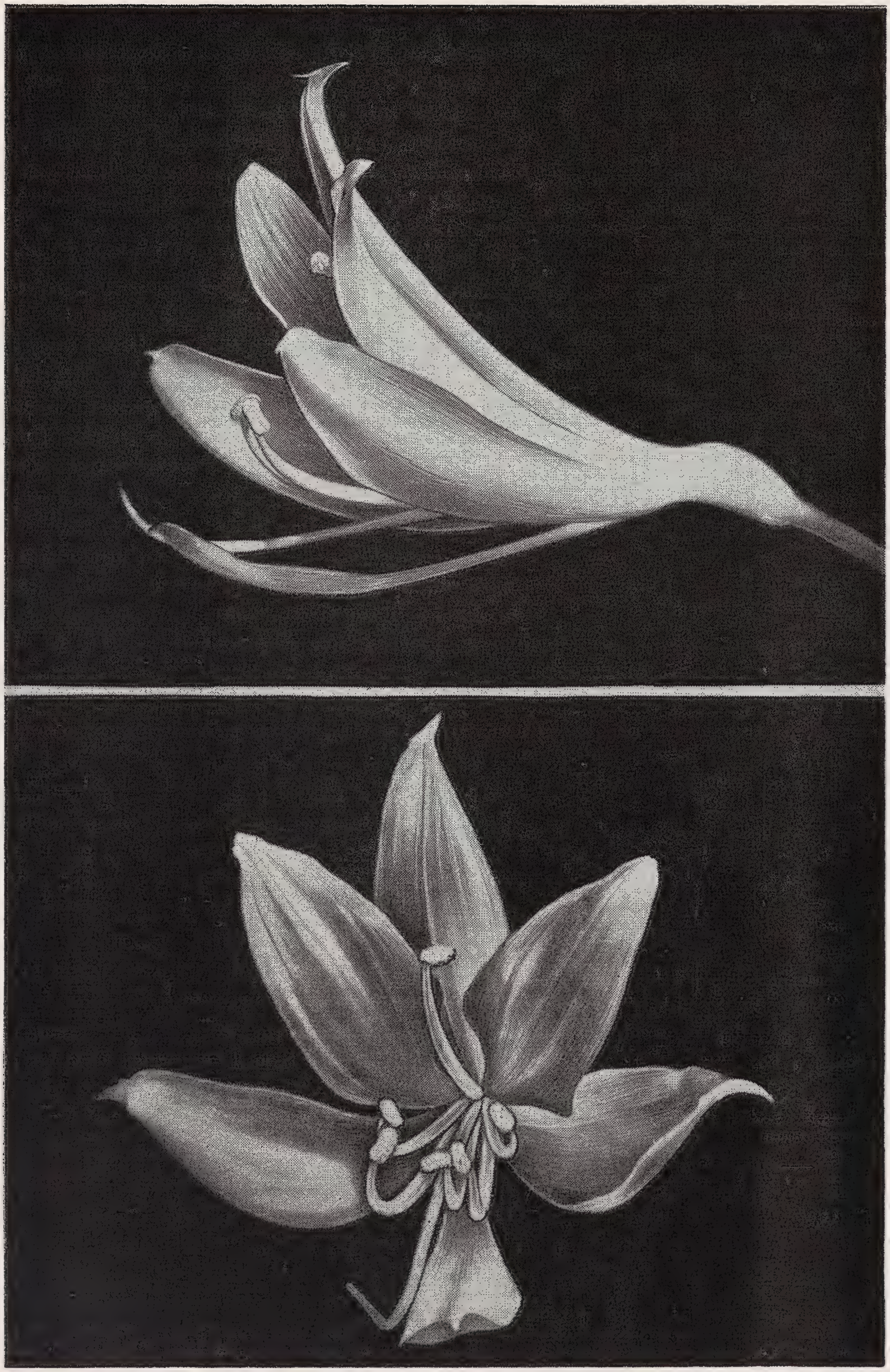

Fig. 17. **Griffinia espiritensis** Rav., Sp. Nov., native to Espirito Santo, Brasil. Details of flower, **upper,** side view; **lower,** front view. Photos by P. F. Ravenna.

III. AMARYLLIS NOTES

Some new species from Brazil are reported here. Additional miscellaneous notes are also included.

Amaryllis monantha Rav., **sp. nov.** (subgenus **Amaryllis**)

Planta usque 34 cm. alta. Bulbus parvus subglobosus saepe prolificus usque 38 mm. latus in collo perbrevi productus. Folia ad anthesin nulla serotina modice firma haud flaccida, glaucescentia canaliculata usque 15 cm. longa vel infra, circ. 2.5-3 cm. lata. Scapus teres ad 20-40 cm. longus usque 8 mm. latus. Spatha semper uniflora bivalvata; valvae lanceolatae rufescentes circ. 31-60 mm. longae; bractea interior unica lineari-acuta circ. 11-20 mm. longa. Flos declinatus scarlatinus ad 7-11 cm. longus circ. 9-10 cm. latus perapertus intus stella lutescenti notatus. Tepala 3-35 cm. connata oblanceolata, exteriora ad 72-80 mm. longa, circ. 26-33 mm. lata breviter apiculata (apiculus circ. 1 mm. longus), interiora subaequalia sed haud apiculata praeter inferiorem angustius circ. 20 mm. lata. Filamenta declinato-incurva, sepalinum superius ad 44-45 mm. longum, sepalina lateralia ad 49-50 mm., petalina lateralia ad 53-55 mm. longa; petalinum inferius ad 49-52 mm. longum; antherae oblongae paullo arquatae ad 32-50 mm. longae; pollen luteus. Ovarium obovato-ellypticum obtuso-triquetrum ad 6.3-7.3 mm. longum circ. 3.5-4 mm. latum. Stylus declinatus ad 85-99 mm. longus. Stigma capitatus obscure trilobatus.

Hab.—In rupestris ad Serra de Natividade civit. Goiás Brasiliae, etiam in Maranhao (mun. Balsas) in lapidosis nemoribus hemideciduis.

Plant about 34 cm. high. Bulb small nearly globose often producing bulblets about 38 mm. wide with a very short pseudoneck. Leaves none when in flower, serotinous moderately firm in texture not flaccid, glaucescent canaliculate about 15 cm. long or less, 2.5-3 cm. broad. Scape cylindrical about 20-40 cm. long, 8 mm. broad. Spathe always 1-flowered bivalved; valves lanceolate rufescent about 31-60 mm. long; inner bract single linear-acute about 11-20 mm. long. Flower declinate scarlet about 7-11 cm. long, 9-10 cm. in diameter widely expanded; marked by a yellowish star in the inside. Tepals connate for 3-3.5 cm., oblanceolate, the outer about 72-80 mm. long, 26-33 mm. broad shortly apiculate (apiculus about 1 mm. long), inner nearly equal but not apiculate, excepting the lower which is narrower, about 20 mm. broad. Filaments declined-incurved, the upper episepal about 44-45 mm. long, both lateral episepal about 49-50 mm. long, lateral epipetal about 53-55 mm. long, lower epipetal about 49-52 mm. long; anthers oblong somewhat arched, about 32-50 mm. long; pollen yellow. Ovary obovate-ellipsoid obtusely trigonous about 6.3-7.3 mm. long, 3.5-4 mm. wide. Style declinate about 85-99 mm. long. Stigma capitate obscurely trilobed.

Hab.—Between rocks or in stony soil on the Serra de Natividade, in the State of Goiás, Brazil; also in southern Maranhao (mun. Balsas) growing among stones in hemiciduous woods.

Specimens.—Brazil, State of Goiás, Serra de Natividade, rocky and stony slopes; leg. Ravenna 157, nov. 1962 (type in the Herb. Ravennae, isotype TRA).

This interesting species is closely related to **A. belladonna** Linn. Actually the flower is very similar in shape, but the one-flowered inflorescence, the aspect of bulb and leaves, and its habit, prove unmistakably that it is a distinct species.

It was found by me in northern Goiás, in rocky places on the Serra de Natividade, the same mountain where Gardner collected so many interesting plants. It was growing under partial shade associated with **Cipura flava** Rav. (Iridaceae). I have seen it again on stony soil, in semideciduous flat-woods of southern Maranhao. Unfortunately the bulbs were lost in cultivation.

Amaryllis restingensis Rav., **sp. nov.** Fig. 18 (subgenus **Omphalissa**)

Planta circ. 70 cm. alta. Bulbus ovato-globosus ad 7 cm. longus circ. 6 mm. latus in collo circ. 10-11 cm. longus productus. Folia ad anthesin incipientia ad 20-28 cm. longa circ. 2-2.5 cm. lata viridia canaliculata obtusa vel subacuta paullo carinata. Scapus pruinosus ad 52 cm. longus ad basin circ. 21 mm. latus. Spatha biflora; valvae subaequales marcescentes ad 5 cm. longae; bracteae interiores duae lineares ad 5 cm. longae. Flores rubri ad 10.5 cm. longi circ. 12.2 cm. lati extus nervis fusco-rubris persinuosis notati. Pedicelli ad 77-82 mm. longi, circ. 6.5 mm. lati. Tepala circ. 12-15 mm. concrescentia ad faciem adaxialem stria media viridia notata, exteriora subolanceolata saepe undulata, exteriori-superius ad 10.5 cm. longum circ. 46-47 mm. latum, exteriori-lateralia apicem versus paullo arquata ad interiori-inferius approximata usque 9 cm. longa circ. 3.9 mm. lata, interiori-lateralia recurve patentia ad 9.8 cm. longa circ. 30 mm. lata, interiori-inferius anguste oblanceolatum ad 9 cm. longum circ. 17 mm. latum ad fasciculum staminorum appressum. Filamenta arquate erecto-patentia 4-seriata ad 73-83 mm. longa ad 42 mm. e basinalbicantia vel albo-viridescentia, deinde rubella. Antherae oblongo-reniformes ad 5-5.5 mm. longae, pollen luteus. Paraperigonium subobsoletum in ciliis circ. 0.8 mm. longis reductum. Ovarium oblongum ad 16-17 mm. longum circ. 8.5-9.5 mm. latum. Stylus arquate erecto-patens ad 11-11.5 cm. longus, inferne albo-viridescens superne rubrus; stigma trifidus, lobis circ. 3.5-5 mm. longis.

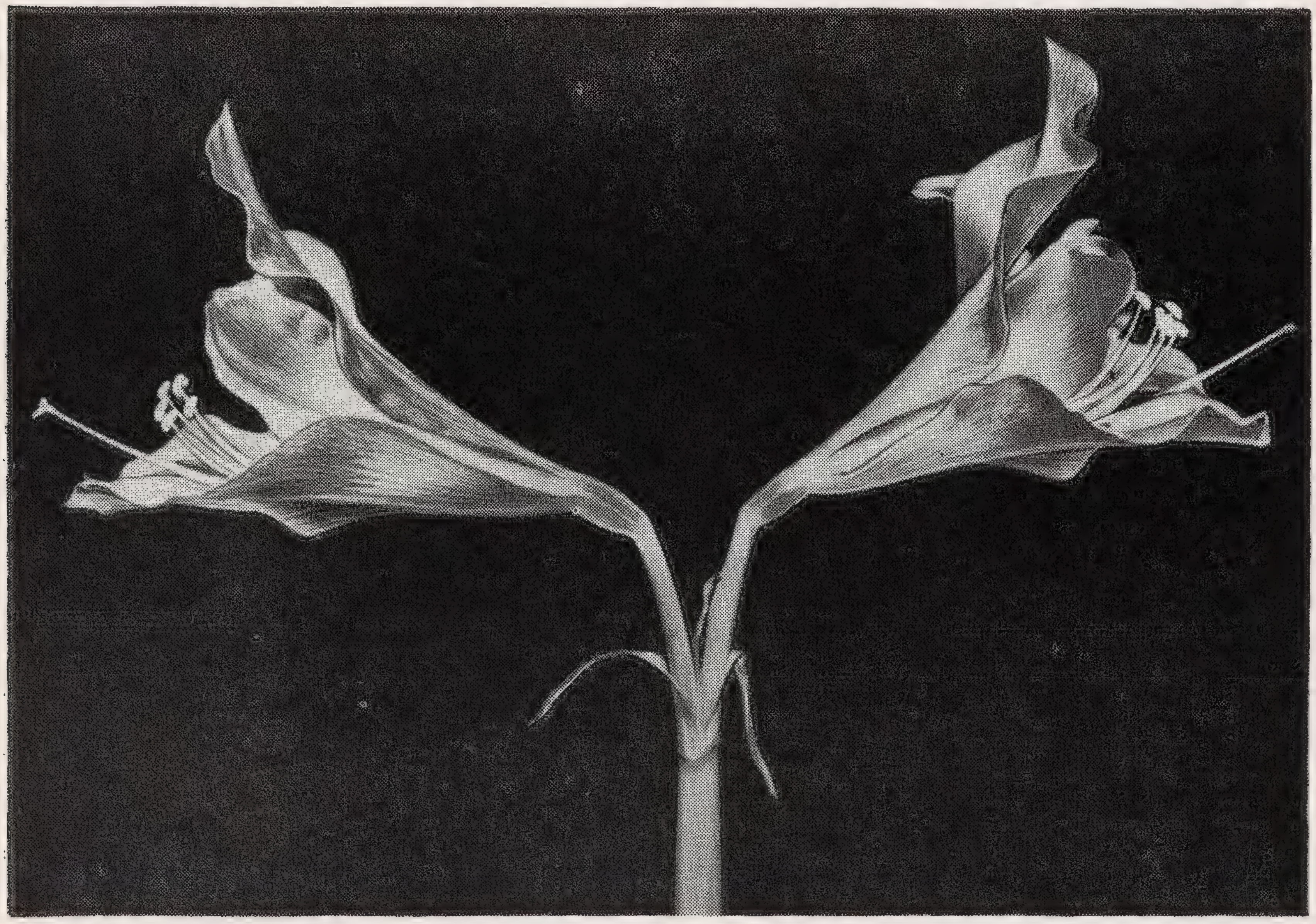

Fig. 18. **Amaryllis restingensis** Rav., **sp. nov.**, native to Guanabara, Restinga, Brasil. Photo by P. F. Ravenna.

Hab.—In arenosis littoraneis dictis "restinga" prope Yacarepaguá civit. Guanabara Brasiliae. Crescit prope **Diplothemium marittimum** Mart. **Cereus fernambucensis** Lem. **Epidendrum aellypticum** Grah., **Canavalia obtusifolia** D.C. et caet. Culta in horto meo.

Plant about 70 cm. high. Bulb ovate-globose, about 7 cm. long, 6 mm. wide, produced into a 10-11 cm. long pseudoneck. Leaves incipient when

in flower, about 20-28 cm. long, 20-22 mm. broad, green, chanelled, somewhat carinate, obtuse or subacute. Scape glaucescent about 52 cm. long, 21 mm. at the base. Spathe 2-flowered; valves nearly equal, marcescent, about 5 cm. long; inner bracts two, linear, about 5 cm. long. Flowers bright red, about 10.5 cm. long, 12.2 cm. in diameter with markedly sinuose deep red veins in the outside. Pedicels about 77-82 mm. long, 6.5 mm. broad. Tepals united for 12-15 mm., with a green band on the adaxial face; the outer nearly oblanceolate, often undulate, the upper outer about 10.5 cm. long, 46-47 mm. broad, lateral outer somewhat arched toward the apex, approximating to the lower inner, about 9 cm. long, 3.9 mm. broad, lateral inner recurvely spreading, about 9.8 cm. long, 30 mm. broad, lower inner narrowly oblanceolate, about 9 cm. long, 17 mm. broad, appressed to the stamen-fascicle. Filaments arched ascending, pale greenish from the base to 42 mm., reddish upwards. Anthers reniform-oblong about 5-5.5 mm. long; pollen yellow. Paraperigone nearly obsolete, reduced to whitish cilia, about 0.8-1 mm. long. Ovary oblong about 16-17 mm. long, 8.5-9.5 mm. broad. Style archedly ascending, about 11-11.5 cm. long, white-greenish below, red toward the apex; stigma trifid, its lobes 3.5-5 mm. long.

Specimens: Brazil, Guanabara, Restinga near Yacarepaguá, leg. Ravenna, Sept. 1965 (type in Herb. Ravennae).

This handsome species seems to be the only amaryllid which grows at full sun in the restingas of the State of Guanabara and probably too in all the State of Rio de Janeiro. **A. reticulata** is also found near the sea, but in woods as well as **Griffinia hyacintina** Ker.

It is nearly related to **A. maracasa** Traub, from which is distinguishable by the less flattened bright red flowers; its veins in the outside are sinuose in such a way as to give the flower a squared effect.

Amaryllis argentina (Pax) Rav., comb. nov.

Crinum argentinum Pax, Engler Bot. Jahrb. 11: 325. 1890; **Hippeastrum tucumanum** Holmberg, An. Mus. Nac. Bs. As., ser. III, 5: 153. 1905; **H. candidum** Stapf, Curtis' Bot. Mag. 153: tab. 9184. 1927; **Amaryllis candida** (Stapf.) Traub et Uphof, Herbertia 5: 123. 1938 (non tratt nec Lindl.); **A. tucumana** (Holmb.) Traub et Uphof, loc. cit.: 124; **Amaryllis immaculata** Traub et Moldenke, Amaryll. Tribe Amarylleae, 108. 1949; **Hippeastrum argentinum** (Pax) Hunziker, Kurtziana 4: 13. 1967.

Hab.—It grows in mountains of the provinces of Catamarca, Tucumán and Salta, especially on sandy places or between rocks. **Crinum argentinum** (Pax) was an earlier binomial for the species. The complete list of synonyms is given.

Specimens.—Argentina, Catamarca, dept. Andalgalá, common in slopes at El Suncho, 1600 m; leg. Joergensen 1481, II-1915 (SI). Tucumán, dept. of Capital, river Sali, 500 m; leg. S. Venturi 1283, 26-X-1921 (SI, LIL). Dept. Tafi, Tafi del Valle; leg. Schreiter s/n, 15-IX-1941 (LIL). Idem, La Hoyada, 1500 m; leg. Schreiter 4187, 18-XI-1923 (LIL). Idem, Sierra de San Javier; leg. Schultz, IX-1880 (phototype from F 9960, the type at B). Dept. Burruyacu, river Toro; leg. S. Venturi 2733 (LIL). Idem, Quebrada de Lules; leg. Schreiter 1379, 28-X-1920 (LIL). Dept. Trancas, Trancas; leg. M. Lillo 9809 (LIL). Salta, dept. Candelaria, Sierra de la Candelaria, 1200 m; leg. S. Venturi 3671, 2-II-1925 (SI).

Amaryllis argentina (Pax) Rav., ssp. **plicatilis** Rav., **ssp. nov.**

A subspecies argentina hypanthio viridi, foliis erectis prater tertium superiores vel infram arcte conduplicatis recedit.

Hab.—In montibus provinciae Jujuy Argentinae regionibus Tilcarae Tumbayae et caet. Culta in Hortus Botanicus Castelarensis. et in horto meo Bonariae.

It differs from the typical subspecies because of the green hypanthium and its erect stiff leaves, which are strongly conduplicate for much of their length.

Hab.—Mountains of the province of Jujuy, Argentina, near Tilcara, Tumbaya and other places.

Specimens.—Cultivated in the botanic garden of Castelar and in my collection from bulbs obtained from the province of Jujuy, Argentina; leg. Ravenna 505, dec. 1967 (type in Herb. Rav., isotype BAB). Argentina, Jujuy, dept. Tilcara, Yala de Monte Carmelo, 2900 m; leg. Fabris et al. 6446, 19-21-I-1966 (LP). Idem, dept. Sta. Bárbara, on the way to El Fuertè, on front of Madrejón; leg. Cabrera 16253, 23-X-1964 (LP). Idem, dept. Tumbaya, Chilcayo, Quebrada Grande, 2400 m; leg. Fabris et al. 6286, 8-I-1966 (LP).

This is apparently the plant which is cultivated in the United States as **Amaryllis candida.** The subspecies **argentina** has spreading, somewhat recurved, not conduplicate leaves, as in many other species of the genus.

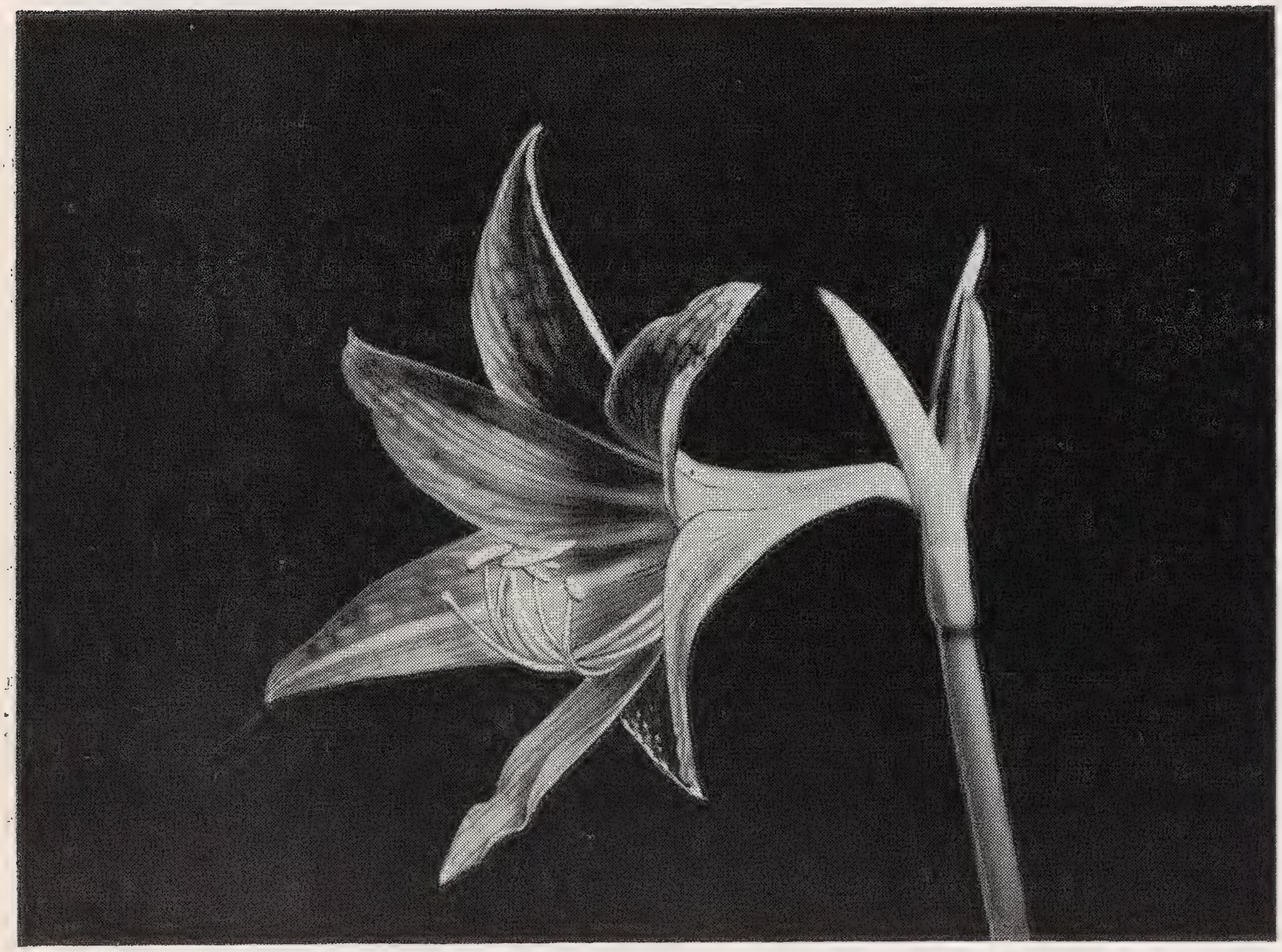

Fig. 19. **Amaryllis reticulata** L'Hérit., as found in Misiones, Argentina. Photo by S. Magno.

Amaryllis reticulata (Fig. 19) in the flora of Argentina

During my searches concerning the identification of **Amaryllis petiolata** Pax, a dry specimen from the province of Misiones, which was determined as this species, proved to be **A. reticulata** L'Her. Thus, the presence of the latter in Argentina is here reported for the first time.

It is not the first case about species from the east side of southern Brazil, which are found in the Argentinian Mesopotamia (including Misiones) or in Paraguay. Among them, **Neomarica candida** (Hassl.) Sprague (Iridaceae) and **Zephyranthes flavissima** Rav. have such discontinuous ranges.

Recently, it seems that also a **Crinum** species has the same peculiar distribution.

Our plants belong to the typical form, without the white streak on the leaves.

Specimens.—Argentina, Misiones, Campiña de Américo; leg. C. Spegazzini (BAB 16700, SI); Argentina, Misiones, dept. of La Frontera, Campiña de Américo; leg. C. Spegazzini, 2-III-1907 (BAB 16701 & 16703, SI), Idem ibid., Barracón; leg. C. Spegazzini, 3-III-1907 (BAB 17154).

The real country of **Amaryllis vittata** L'Herit. Fig. 20

Most of the **Amaryllis** hybrids so appreciated in gardening, were obtained by crossing **A. aulica, A. reticulata, A. reginae, A. vittata** and a few others. Some of the commonest forms in gardens are the striped form known as "vittata hybrids". These come from the first reported breeding attempts in the genus: **A. X johnsonii,** a hybrid between **A. reginae** and **A. vittata.**

The place of origin of **A. vittata** was quoted as "Andes of Peru" but this has not been verified. In fact the species has not been collected in Peru and the exact range remains a mystery up to the present.

Due to the above mentioned reasons, the discovery of this species among dry material from the States of Santa Catarina [1] and Rio Grande do Sul,[2] in Brazil, appeared to be an extremely interesting event. The original text and especially the figure from L'Heritier's Sertum Anglicum (p. 13, tab. 15) were examined and no doubts remained about the identification. This was reinforced by comparing some photographs (one of these is reproduced in Fig. 20), made by P. R. Reitz, after L'Heritier's drawing.

In the 1966 Plant Life (see Fig. 12 in that publication), R. E. Herold reports on a cultivated plant identified as **Amaryllis vittata,** but the flowers are declined, and should apparently be regarded as a hybrid involving **A. belladonna** and **A. vittata.**

The species was collected in the past, in Santa Catarina, by Tweedie. The specimen, consisting of a sole flower, was deposited at Kew and served Herbert for erecting **"Hippeastrum ambiguum** var. **tweedianum".** This variety was transferred by Traub (1958), to **A. vittata** L'Her. var. **tweediana** (Herb.) Traub, the last combination. As Baker says (1888), "it varies much in the size of the flower and distinctness of the stripes". This point proved to be true also in the wilds, varying somewhat also in shape, and number of flowers in the inflorescence. The slight differences does not warrant a specific name. Therefore the variety **tweediana** should be included in synonymy as following:

Amaryllis vittata L'Heritier, Sert. Angl.: 13, pl. 15. 1788; **Hippeastrum vittatum** (L'Her.) Herbert, App. Bot. Reg.: 31. 1821; **Amaryllis lineata** Colla, Hort. Rip.: 3. 1824; **A. superba** Bury, Hexand. Pl: pl. 31. 1831-34; **Hippeastrum ambiguum** Hook. var. **tweedianum** Herbert, Amaryll.: 136, tab. 22, f. 3. 1837; **Hippeastrum solandriflorum** Herb. var. **tweedianum** Herbert, Curtis' Bot. Mag. 66: tab. 3771. 1841; **Chonais vittata** (L'Her.) Salisbury, Gen. Pl. Fragm.: 135. 1866; **Amaryllis vittata** (L'Her.) var. **tweediana** (Herb.) Traub, Amaryll. Man.: 268. 1958.

Specimens.—Brazil, Santa Catarina, mun. Campos Novos, Palmares, 900 m; leg. Klein 4085, 28-X-1963 (HBR). Idem, Marombas; leg. L. B. Smith & R. M. Klein 13349, 16-XI-1964 (HBR). Idem ibid.; leg. Reitz 6748,

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[1] The material was sent to the writer, by the staff of the Herbarium "Barbosa Rodrigues" (HBR.), in order to carry out the **Amaryllidaceae** for the "Flora Ilustrada Catarinense".

[2] Herbarium Anchieta (PACA); the material was studied in the Escola de Filosofia at Sao Leopoldo, State of Rio Grande do Sul, Brasil.

22-XI-1964 (HBR). Idem, Campos Novos, 1000 m, campo humido; leg. Klein 4212, 29-X-1963 (HBR). Rio Grande do Sul, mun. Canoas, Esteio, in fossa; leg. P. B. Rambo 752, 5-X-1933 (PACA). Idem, via ferrea; leg. P. B. Rambo, 5-X-1933 (PACA 33948). Idem, Padres, 23-I-1957 (PACA 60220). Idem, Sao Leopoldo; leg. L. Pheissen 129 (PACA).

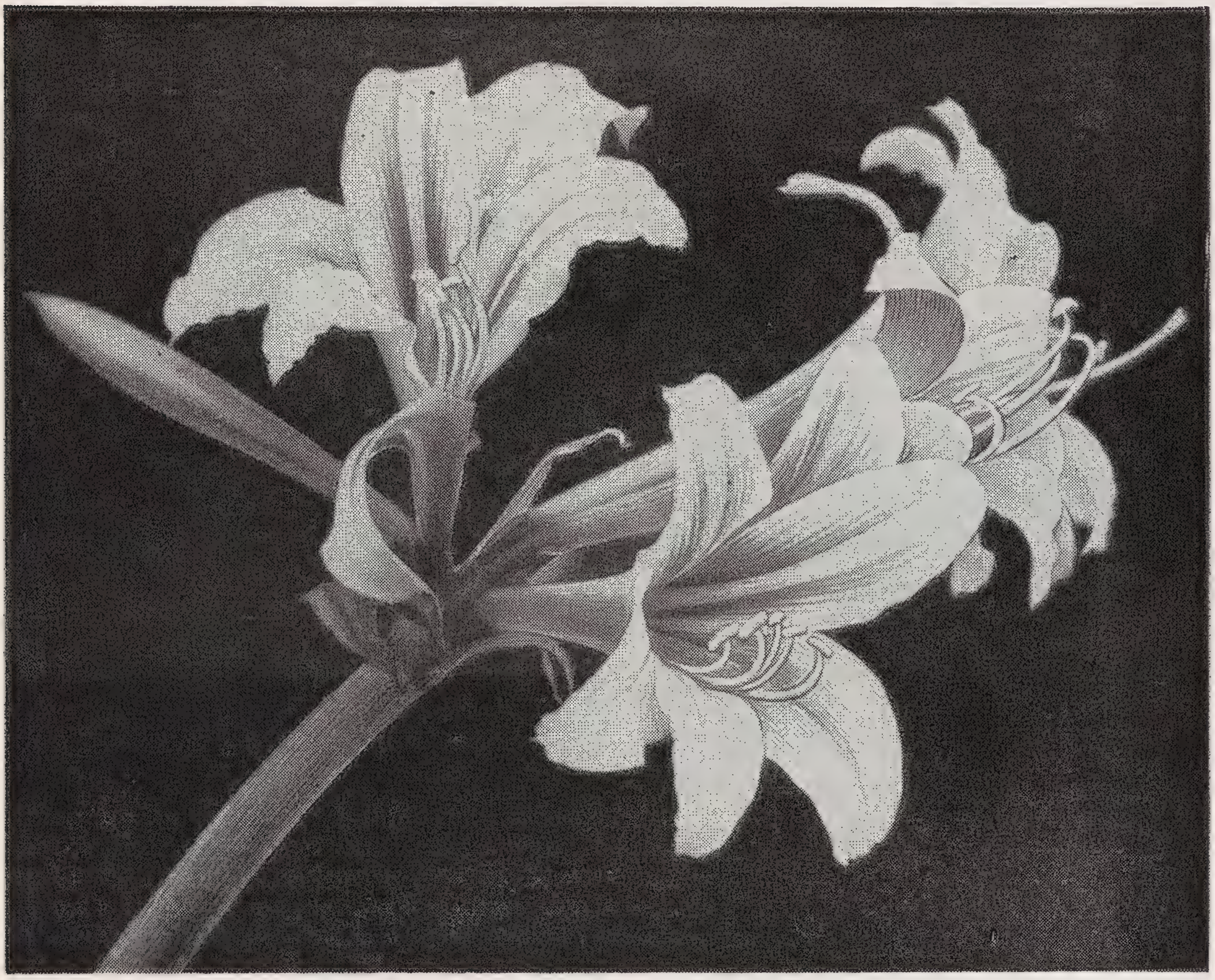

Fig. 20. **Amaryllis vittata** L'Hérit., native to southern Brasil. Drawing by P. R. Reitz after the figure of L'Héritier.

IV. **NOTHOSCORDUM** NOTES, 1968

Nothoscordum felipponei Beauv. ssp. **lorentzii** (Hert.) Rav. (Fig. 21)

On page 50 of the 1966 edition of Plant Life, the new combination **Nothoscordum lorentzii** (Hert.) Rav. was made. Having had access only to a dry specimen, at that time this position seemed correct. Lately however, after having the opportunity of studying large populations in the field, it became clear that our plant must be regarded as a subspecies of **N. felipponei Beauv.:**

Nothoscordum felipponei Beauv., ssp. **lorentzii** (Hert.) Rav., **comb. nov.**

Beauverdia lorentzii Herter, Boissiera 7: 509. 1943; **Ipheion lorentzii** (Hert.) Traub, Pl. Life 5: 50. 1949; **Tristagma Lorenzii** (Hert.) Traub, Pl. Life 19: 61. 1963; **Nothoscordum lorentzii** (Hert.) Ravenna, Pl. Life 23: 50. 1967.

Plant about 6-12 cm. high. Bulb subglobose or depressed-globose, about 20 mm. wide, covered with whitish or sometimes pale ochraceous coats;

pseudoneck present. Leaves a deep green, linear, with ciliate margins, moderately canaliculate, about 10-19 cm. long, 2-3.4 mm. broad. Scapes often more than one for each bulb, somewhat compressed, often puberulent, about 7-10 cm. long, becoming decumbent after flowering. Spathe one-flowered; valves membranous, lanceolate, ventricose, about 16-17 mm. long, connate for 2-2.2 mm. at the base, sometimes with purplish streaks. Pedicel often puberulent, about 5-15 mm. long. Flower yellow, about 28-33 mm. in diameter. Tepals always eight, oblanceolate, blunt or acute, about 20-23 mm. long, connated for 3 mm. toward the base, the outer four slightly longer than the inner, tinged with reddish-brown, or sometimes with a green streak, on the abaxial face, the inner not striped. Stamens eight, in two sets, its filaments oblong-subulate, yellow, the four episepals about 8 mm. long, the epipetals to 9.5 mm. long; anthers versatile, oblong, sometimes slightly arched, about 2.5-3 mm. long. Ovary ellipsoid, green, about 5-5.4 mm. long, 3-3.2 mm. wide. Style broadly filiform, about 6-6.5 mm. long; stigma thick, capitate, whitish, sometimes irregularly lobed.

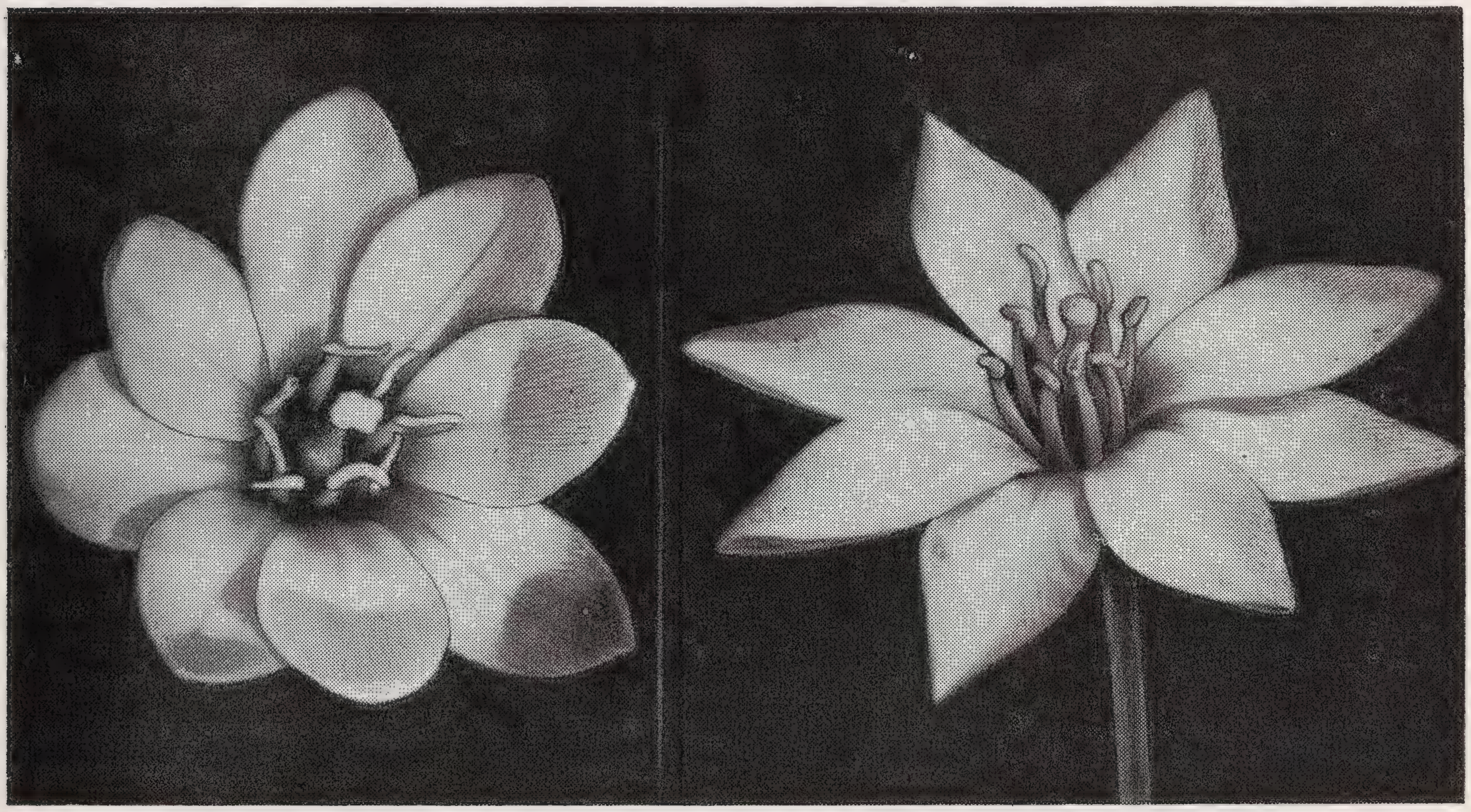

Fig. 21. **Nothoscordum felipponei** Beauv. ssp. **lorentzii** (Hert). Rav., native to southern part of Province of Entre Rios, Argentina.

Hab.—Apparently only in the south of the province of Entre Rios, Argentina. It grows near **Nothoscordum bonariense** (Pers.) Beauv. (two varieties), N. vittatum (Gris.) Rav.; sometimes also with **N. inodorum** (Ait.) Nich., ssp. **N. montevidense** Beauv., **Tristagma tweedianum** (Bak) Traub, and **Sisyrinchium pachyrhizum** Bak. (Iridaceae). Cultivated in my collection.

Specimens.—Argentina, Entre Rios, dept. Concepción del Uruguay, Campichuelo, banks of the river Uruguay; leg. Burkart & Troncoso 24138, 10-IV-1963 (SI). Idem, Agricultural Exp. Farm., in fields of rice; leg. Ravenna 625, Apr. 1967 (Herb. Rav.). Idem, dept. Gualeguaychú, near Gualeguaychú, on the way to the stream Gualeyán; leg. Ravenna 623, Apr. 1967 (Herb. Rav.).

This plant (Fig. 21), separable as a species is distinguishable from **felipponei** on account of its amazing tetramerous flowers, its thicker stigma, the ciliated leaves, the almost always pilose scapes and pedicels, and its repellent alliaceous smell. Moreover this is a fall-blooming (April), in contrast with the type which flowers in August-September.

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PLANT LIFE LIBRARY—continued from page 54.

FLORA OF ALASKA AND NEIGHBORING TERRITORIES, by Eric Hulten. Stanford University Press, Palo Alto, Calif. 1968. Pp. xxii + 1008. Illus. $35.00. This is apparently the definitive work on the Flora of Alaska (U.S.A.), and Yukon and Northwest Territories (Canada), and the eastern extremity of Siberia (USSR). Some 1,974 taxa, belonging to 1,559 species are described; for 1,735 of these detailed descriptions, nomenclature, plant drawings and range maps are provided. There is an artificial key to the families and an analytic key to all species of each genus. The introduction is concerned with the past and present climatic, geologic and ecologic character of the regions covered, and the history of botanical collections. The glossary, plant author's list, bibliography and indexes complete the volume. This excellent book is highly recommended to all interested in the Arctic flora.

PLANT LIFE LIBRARY—continued on page 96.

3. GENETICS AND BREEDING

BIGENETIC HYBRID OF SPREKELIA AND HABRANTHUS

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The writer's experience in combating sterility in inbred *Amaryllis* strains has suggested experimentation with hybrids between genera. One cross that was apparently successful used a free-blooming clone of *Sprekelia formosissima superba* as seed parent and a vigorous form of *Habranthus robustus* as pollen parent.

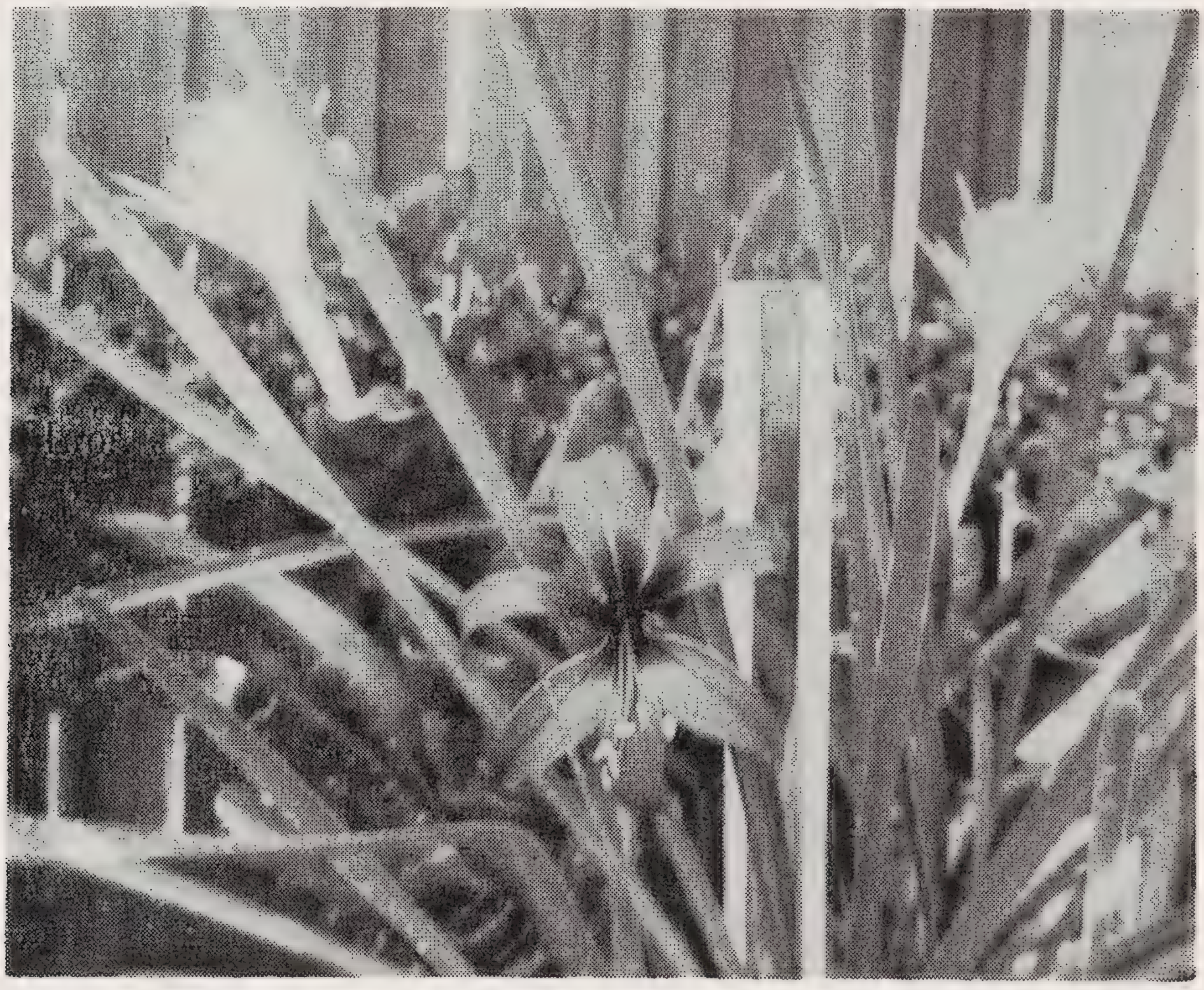

Fig. 22. **Sprekanthus cagei** Traub, **bigeneric hybr. nov.,** center, a bigeneric hybrid involving **Sprekelia formosissima** and **Habranthus robustus,** made by John M. Cage of Palo Alto, Calif. Ruler is 1-inch wide.

Seedlings are very uniform in appearance and growth habit. In two years of growth in a cool greenhouse, the leaves reached a mature height of about 14 inches and a width at the base slightly exceeding 1/4 inch. Maximum width at a height of 10 inches is 3/8 inch. The leaf shape resembles *Sprekelia*, but the size is smaller than either parent (Fig. 22). The color of the foliage is dull medium green.

Semi-dormancy occurs in winter. However, blooming does not seem to be clearly related to dormancy. Three of the bulbs have bloomed to date, all at different times, even though all were grown in a community pot. Next season, the plants will be forced into deeper dormancy to encourage free blooming.

The mature bulbs are 1¼″ to 1½″ in diameter and have the long neck shape of *Sprekelia.* They are slightly smaller than the *Habranthus* bulbs of their parent and much smaller than *Sprekelia.* Offsets are produced sparingly.

The beautiful single bloom develops rapidly on a slender scape hardly more than ¼″ in diameter and about 16 inches in height. The form of the blossom is nearly identical with that of *Sprekelia,* but the size is only about one-third. Apparently the flower lasts somewhat longer than *Sprekelia.*

The color is scarlet with a hint of the lavender from *Habranthus.* Two of the flowers were of solid color to the very bottom of the throat, unlike the green-throated *Sprekelia* parent. The other blossom had faint stripes of pale green deep in the throat.

The hybrid seems to be a true mule. Selfing seems totally ineffective, and a back-cross on *Habranthus* forms seeds that are not viable. Further efforts will be made to develop a fertile new plant type.

If viable seeds can eventually be obtained either by selfing or back-crossing, some interesting possibilities exist. Since we have the white-flowered *Habranthus* available, we may produce a white *Sprekelia* form in due course, as well as other colors. The writer believes that selfing can be obtained if the right treatment is found.

The possibility that the *Sprekelia-Habranthus* cross could be made was predicted by Traub in his book, The Genera of Amaryllidaceae (1963). He indicated that x=6 is the basic chromosome number for the *Amaryllidaceae* as a whole, and also the tribe *Zephyrantheae* in which he placed *Habranthus* and *Sprekelia* among other genera. Previously, most lineagicists had placed *Sprekelia* in the same tribe with *Amaryllis* L., and that was apparently wrong. Of course, a cross of *Amaryllis* and *Sprekelia* [often attempted but never realized.—Ed.], though highly unlikely, would evoke some consternation.

In PLANT LIFE, Vol. 23, 1967, Flory & Bose speculate in their paper, "*Sprekelia* Chromosomes", that the highly polyploid commercial *Sprekelia* may have a basic chromosome number of x=6. Since 2n=12 appears in at least some *Habranthus* species, the writer's hybrid may tend to support the above hypothesis.

X **SPREKANTHUS**, BIGENERIC HYBRID

The Sprekelia-Habranthus hybrid has been named for the originator, X **Sprekanthus cagei.**

X **Sprekanthus** Traub, **bigeneric hybr. nov.** et, **Sprekanthus cagei** Traub, **hybr. nov.** typus. Planta hybrida "Sprekelia formosissima superba" et "Habranthus robustus" intermedia; colore plusminusve inter parentes medio; aliter velut in parenta foeminea sed parviora. Holotypus (Holonomenifer): John M. Cage No. 1 (= TRA 1087), Febr. 15, 1968. Fig. 22.

Hybrid between Sprekelia **formosissima superba** ♀ and **Habranthus robustus** ♂. Plant more or less intermediate in color between the parents; otherwise similar to the seed parent but smaller.—**Hamilton P. Traub**

HYBRIDIZING WITH AMARYLLIS SPECIES—1968

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LONG-TRUMPET HYBRIDS

1968 will be remembered by me as the year of the long-trumpets. The first important event was the flowering of *Amaryllis fragrantissima* very early in January. Presumably, this was the first flowering of this species outside of Bolivia. *A. fragrantissima* is a truly magnificent species and even finer in some respects than had been anticipated from Dr. Cardenas' description (Plant Life, Vol. 16, 1960. P. 32-33). The two florets were about 20.5 cm. long (tepaltube about 9.5 cm.) and about 13 cm. in diameter. They were on a very tall, robust scape (68-70 cm. tall) and were held almost horizontally and nearly 180° apart. The substance, regularity, and intensity of whiteness of the segments were outstanding. The fragrance also was delightful; it was detectable two or three rooms away from the flowering plant but was in no way overpowering or objectionable at a distance of only three or four feet.

Since *A. fragrantissima* bloomed so early in the year, there was very little fresh pollen available and this was probably fortunate. One floret was self-pollinated and this gave rise to a seed pod which required nine weeks to mature in a greenhouse at temperatures of 45 to 75°F. with an average probably near 55°F. The seed were quite normal in appearance and germinated very well, approaching 100%. The seedlings are now (July 15) putting on their fourth leaves and for the most part appear moderately vigorous. A pollination with mixed pollen of a white leopoldii hybrid and *A. evansiae* failed to set seed. This particular clone of *A. fragrantissima* is amazingly vigorous. Since flowering it has grown 12 leaves, each one near the size of those of modern large hybrids.

The pollen of *A. fragrantissima* gave viable seed with the following pod parents: *A. striata* var *fulgida; (A. belladonna* x *A. striata)* x 'Senorita'; orange reginae x 'Senorita'; Ludwig's 'Constant Comment'; and Ludwig's 'Fantastica'. Although seed pods were set, no viable seed were obtained from a white leopoldii and a red leopoldii. Of course, it is not known if the trumpet shape and size of *A. fragrantissima* will be dominant in these crosses; if not, back-crosses with *A. fragrantissima* will be desirable. Also, more crosses are needed in the bright colors (red, orange, and rose pink or pink) to get trumpet flowers in these colors. Pollen of *A. fragrantissima* was disseminated fairly widely and some successes are known to have been achieved by others.

The second event of major importance was the flowering in May of a second long-trumpet. This plant was very generously turned over to me by Mrs. U. B. Evans of Haphazard Plantation, Ferriday, Louisiana, who in turn had gotten it from the late Prof. Ira S. Nelson. The history of 'Evans trumpet' prior to this time is apparently lost. 'Evans trumpet' had grown well outdoors in Mrs. Evans' garden for several years and appears to be a form of *A. ambigua;* the coloring is almost identical but the size of the florets (six) is somewhat smaller (14.5 cm. long and 7.0 cm. tepaltube). Since the plant was dug from Mrs. Evans' garden after the scape had started up and a considerable part of the large root system was damaged or lost, this may account, in part, for the smaller size. The bulb and foliage are large, near large hybrid size, and apparently it does not make offsets. However, the really wonderful characteristic is that 'Evans trumpet' appears to be quite fertile to cross-pollination and quite a few seed were obtained from pollination with *A. fragrantissima* (two pods), also one seed pod from pollen of a ''yellow long-trumpet'' grown by a friend in California and also a pod from mixed pollen of the ''yellow long-trumpet'' and a seedling of Ludwig's 'Maria Goretti' x 'Senorita'. All seed germinated rapidly and the seedlings are now showing one broad, dark green leaf. Although facilities for a literature search are limited, no reference has been seen concerning crosses where both parents were long-trumpets and so these may be the first. 'Evans trumpet' failed to set seed to self-pollination. Therefore, it is behaving very much as we have come to expect many *Amaryllis* species to do, very fertile to cross-pollination and sterile to self-pollination. Since it appears not to make offsets and is self-sterile, no progress can be made in multiplying this species until possibly another clone of this ''fertile *A. ambigua*'' is found or the rather drastic step of cuttage is employed. Pollen from 'Evans trumpet' was used on a late-flowering, pink semi-miniature from Ludwig's 'Constant Comment' x 'Senorita' and a number of seedlings have just put out their first leaf. These first leaves are much narrower than those from 'Evans trumpet' as the seed parent. In any event, 'Evans trumpet' is a most welcome and valuable addition to a species collection and a really lucky break for me.

Other long-trumpets have been acquired. A blooming size *A. viridiflora* from Bolivia has grown four long narrow leaves this Spring and may bloom next year. *A. immaculata* has been obtained from Holland and is expected to bloom next year. So, maybe more long-trumpet crosses are just around the corner.

THE QUEST FOR YELLOW HYBRIDS

Seedlings from the following crosses bloomed in 1968. (See Plant Life, Vol. 24, 1968; p. 69, 70.)

(1) [A. evansiae x A. aglaiae x A. evansiae] x 'Maria Goretti' (two plants).

(2) 'Maria Goretti' x (A. evansiae x White Dutch) (four plants).

(3) 'Winter Carnival' x (A. evansiae x White Dutch) (one plant).

Of course, none of them was yellow. Most of them showed faint to moderate amounts of very pale yellow in a large throat area just as each floret was opening. However, this had changed by the next day to green in the throat and a creamy white further out on the segments. All showed some pink, red or orange-red coloring. One was a quite acceptable, pale pink blush with more tendency toward yellow than the others. Several had considerable light red on the outer parts of the segments and were fairly attractive but not near the hoped-for result. The really discouraging point was the sterility exhibited by these plants; all self-pollinations failed and only one sib cross gave a seed pod but the seed failed to germinate. Next year an additional six to eight plants from these crosses should bloom and maybe some of them will be fertile. However, this problem may require a really massive attack and therefore five additional clones of *A. evansiae* have been obtained from Mr. Alek Korsakoff of Jacksonville, Florida. Since these are seedlings from three fertile clones of *A. evansiae,* it is hoped that they will set viable seed with pollen from a number of different white leopoldii hybrids and that these offspring will, in turn, have a greater tendency to be fertile.

A number of seedlings flowered this season from 'Firefly' x (A. evansiae x White Dutch), a cross of which I was not particularly proud and which has not been mentioned previously. Most of the seedlings were fairly uninteresting, a light, dull orange-red in an intermediate size. However, one turned out to be quite different, a light reddish-pink with a broad edging of darker red around the segments. This is a picotee of a completely different sort from those currently on the market. Each floret was about 4½ inches and had some suggestion of a semi-trumpet. It produced viable seed with pollen from a good 'Ludwig Picotee' and 'Nivalis' but did not accept pollen from *A. evansiae.* Possibly the lesson here is that occasionally (very infrequently might be better) a "far-out" cross may result in something quite new and different.

Very beautiful flowers resulted from another cross having *A. evansiae* in its ancestry. Maria Goretti x[(*A. belladonna* x White Dutch) x (*A. evansiae* x White Dutch)].

In two of these siblings, the color of the 6½ inch florets was mainly a very pale (yet bright) pastel pink blush not available in commercial hybrids. The relatively large throat area (good leopoldii form) is a pale, bright green and the combination is quite attractive. These, too, had reduced fertility but a few self and sib seedlings were obtained.

An undesirable characteristic has been confirmed in 'Morris yellow' (see Plant Life, Vol. 24, 1968; p. 70); it is very susceptible to "red fungus" even in the greenhouse. Further, its seedlings and also those of 'Senorita' have shown poor winter survival outdoors when mulched with bagasse which gives good results with most other hybrid amaryllis. This is unfortunate since a major objective of this program is to produce hybrids which will survive long range outdoors in our climate. In addition, because of greenhouse space limitations, seedlings can be allowed only their first winter in the greenhouse and then they must go outdoors. Some crosses survive much better than others and possibly experience will teach us more about what to expect.

THE AULICA GROUP

Only one cross of interest was successful in the aulica group this year: *A. forgetii* x *A. cybister.* Only three seedlings resulted in this case. This is a rather far-out cross and it is difficult to imagine what the foliage characteristics will be from the strongly evergreen *A. forgetii* and the strongly dormant *A. cybister.* Further, *A. forgetii* blooms in

December-January and *A. cybister* in March-May. The flowers are compatible at least from the standpoint of very short tepaltubes and possibly this is a small beginning into the orchid-flowered hybrids.

ACKNOWLEDGEMENTS

As I continue to work with *Amaryllis* species, several other people have given valuable assistance. A number of species that I did not have were available from Mr. and Mrs. Alek Korsakoff, Jacksonville, Florida. Mr. Korsakoff also sent pollen. In California, Mr. W. Quinn Buck, Mr. J. L. Doran and Mr. S. S. Harshbarger all helped greatly by exchanging pollen, seed and plants.

SUITABLE POTTING MEDIUM

Finally, a tip should be passed on about a growing medium that has been very valuable to me for germinating the delicate seed that often result from species crosses. ''Redi-earth'' made by the W. R. Grace Co. appears to have all the attributes required of a good potting mix. At the present, it has been adapted as a germinating medium as follows: Fill the pot or flat with an acceptable soil, sand, leaf mold, dehydrated manure mixture to within ½ inch of the desired level in the container. Wet thoroughly (drainage must be excellent) and smooth. Add about ¼ inch of previously moistened ''Redi-earth'' and smooth and wet thoroughly. Place the seed next; they need not be set vertically but should be arranged with respect to spacing. Add a second ¼-inch layer of previously moistened ''Redi-earth'' to completely cover the seed and wet thoroughly. This is a fairly rapid planting procedure. This medium is very porous but holds moisture extremely well. However, it should be wet thoroughly at intervals, depending on the humidity, if there is the slightest sign of drying out. Germination is rapid and complete within the capacity of the given seed to germinate.

AMARYLLIS FROM IRRADIATED SEEDS

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During the Fall of 1967, a number of packets of seeds were sent to an Oak Ridge Radiation Laboratory and all were irradiated with 15,000 roentgen units of nuclear radiation. Among these seeds were 2 lots of *Amaryllis* seeds: (1) *Amaryllis striata* forma *fulgida* and none of these of mine have survived, and (2) *Amaryllis* hybrid in the ''Dutch Type'' with large red flowers which were pollinated by two different seedling clones of *Amaryllis striata* forma *fulgida*. It is these latter which are now growing and which show variations from the norm. Dr. Traub has written that there are several plants of his which show definite effects of the irradiation. The writer's seedlings were divided into two groups of which the first group were grown as they came back from the irradiation laboratory and the second group were further treated with a solution of colchicine, gibberellic acid and ''Rootone''. These latter if they survived the treatment and after sulking for a while make a rank growth that outgrows anything else that the writer has yet grown. In the straight 15,000 R. units treated group of seedlings, there were noticeably seedlings which had a pronounced ''curl'' to the initial leaf or two, some still appear somewhat stunted and even one after better than 6 months in the soil, it has yet to put forth its first leaf.

Since it was the writer's desire to induce as wide a spectrum of changes in as short a time as possible, various other treatments are being tried this year such as stem injection with a colchicine solution which may overcome the shortcomings which Dr. Henry M. Cathey writes that it has been generally found in *Amaryllis* treated seedlings that diploid tissues overgrow the tetraploid formed tissues and crowd them out.

1968 AMARYLLIS BREEDING REPORT

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The writer has been surprised and confused a number of times in the past two years by the behaviour of certain *Amaryllis* clones, both hybrids and species, which apparently has been caused by their being moved about the country. The bulbs were first moved from a high altitude in Colorado to sea level here in California. Now, bulbs that once grew in the fall (as *A. aulica*) are growing in the spring; others do not want to grow at all here in California; and many have changed considerably both in color and shape of the flowers. One bulb in particular that was a beautiful light pink in Colorado has here produced such dark rose flowers of quite different shape that it was not at first recognizable as the same clone, and yet it had to be the same! Even a move this past February from one location to another one here in the same city has resulted in a difference in the color of the flowers, most blooms this spring being much darker in color than in the previous year. The only conclusion that could be drawn from these experiences was that the character and color of the flowers must be greatly influenced by such factors as *light intensity* at flowering time, soil in which the bulbs are being grown, and perhaps other unknown factors. Hence, the writer was pleased to read in the 1968 Yearbook that Mr. Caldwell had come to the same conclusion in accounting for the unstable color in *Lycoris houdyshelii*.

WINDOW-SILL HYBRIDS

In many respects, the most satisfactory of all the bulbs that the author has raised from seed are the bulbs which he calls his ''Window-sill hybrids''. Some of these were described in the 1968 Yearbook, but more details can now be added. All of these hybrids had as one of the parents the old orange-scarlet hybrid sold by Cecil Houdyshel under the label of ''Rutila hybrids''. Ten successful crosses were made with this clone, seven of which have already bloomed. A self was a very poor grower, but the other six have been characterized by compact foliage, attractive flowers, dependable blooming, and vigorous growth.

Crossed with a Van Meeuwen white Dutch clone, it produced large flowers of orange red, some of which had deeply reflexed tepalsegs. Crossed with a dark red Mead hybrid, it gave 5″ flowers of vivid crimson. Crosses made with a scarlet Indian miniature, and with a white and pink clone of unknown ancestry, both gave flowers identical in color to the original Houdyshel hybrids. Crossed with *A. striata fulgida,* it produced flowers from 4″ to 5″ in size, in shades of orange, and revealing their Striata ancestry in both flower and leaf; these bulbs bloom naturally in mid-winter. The best cross thus far of the ten was the one made with a Ludwig pink Dutch clone. The last bulbs to bloom of this cross finally bloomed this spring at six years of age, with 5½″ flowers which were a blend of rose, white and green in color. Previously there had been flowers in red, dark rose, and white with red markings. Both this cross and the previous one have been used extensively in additional crosses.

When the self bloomed three years ago, it was crossed with a red and white Peruvian Miniature clone, and the plants being raised from this cross are the ones mentioned in the 1968 Yearbook as having the thick gray-green leaves which are so resistant to cold weather and give such a good appearance the entire year. None of these seedlings have bloomed yet, but they are being closely watched. It is rather ironical that the hardiest plants being raised had as one parent this self which was so tender that it perished this past winter when kept outside.

SEARCH FOR RECURRENT-BLOOMING HYBRIDS

The search for recurrent-blooming hybrids is being continued, but with very little success thus far. Up to now, the writer has been working primarily with hybrids of *A. striata,* and although some of these would definitely be recurrent bloomers when grown in a greenhouse, they certainly are not when grown outside. However, by crossing these Striata hybrids with free-blooming, hardier clones of other ancestry, a free-blooming type suitable for outdoor culture in a cool climate may be developed, and so the search continues.

The most promising material grown this past year has been a group of Striata crosses originally made by a friend in Pasadena. Some of the seedlings were raised in his greenhouse in Pasadena, and some by the author in outside plant benches in Torrance. The first and basic cross was between *A. striata fulgida* and a white Dutch clone; these seedlings produced medium-sized flowers of bright orange with a green throat. There was one exception, for one bulb produced a picotee type flower of red on a white background. This bulb bloomed four times within a year, but it was in a greenhouse most of this time. When it bloomed this spring, after having been outside during the winter, the flower was much superior to previous blooms with better color and better substance. However, it refused to start new leaf growth after blooming and eventually perished.

This basic cross has been used in a number of additional crosses by both the author and his friend, having been crossed with 'Tangerine', 'Skildway', *A. evansiae,* and hybrids of *A. aulica, cybister,* and *striata,* as well as being selfed. Two of these crosses have bloomed and are worthy of comment. The first was a self on one of the orange-flowered hybrids. The seed began to germinate Feb. 7, 1966 in a sunny house window, and the seedlings were raised in an outside plant bench. The first one bloomed March 12, 1968, from a bulb only a little over one-inch in diameter. An even smaller bulb tried to bloom, but failed. This first flower was small, under 4″ in diameter, but it may be larger in another year; in color it was a rose red on a white background. The encouraging factors are that this cross is blooming from such small bulbs, and so quickly with outside culture.

The writer's friend in Pasadena also crossed one of the orange-flowered clones of the basic cross with *A. evansiae,* and gave one seedling—the largest—to the writer. After trying to bloom twice last fall, and failing each time, this seedling finally bloomed in May of this year, just a little over two years of age. The short scape produced three beautiful flowers about 4″ in diameter. The color was rather unusual, for the upper half of the flower was a much darker red than the lower half, with a distinct dividing line between the two halves, bisecting the two middle segs. Each tepalseg was tipped with white, and the large star in the throat was a chartreuse green, edged by a narrow band of red purple. This bulb refused to set seed, but it was successfully crossed with a Ludwig white Dutch clone. It is going to be crossed with other hybrids of *A. evansiae* as soon as possible, and in fact, pollen from the graceful hybrid of *(A. evansiae* x *A. aglaiae)* x *A. evansiae* was used on the flower, but the cross failed to take. Incidentally, out of fourteen crosses made with this same pollen, only two crosses yielded any seed, illustrating the point that perseverance pays in the end, since one never knows which crosses will or will not be successful.

MINIATURES

The biggest thrill experienced in the 1968 blooming season came when the first bulb bloomed of a cross between a dark red Indian miniature and a South African clone having large flowers of an unusual shade of rose. This Indian miniature is a recurrent bloomer, and that was the reason for the cross being made in 1964, but the seedlings have grown very slowly. However, the first flower was well worth the wait, because it was a beautiful miniature, in color a glowing dark scarlet with an even darker throat (Fig. 23). The flowers were 4½″ in size, but did not appear to be that large because the tepalsegs were so heavily ruffled, and the blooms were carried so gracefully on a slender scape. The foliage was in correct proportion to the size of the flowers, which even had *quite a fragrance.* The writer would rate this hybrid as the finest one he has yet raised from seed. There are five more bulbs of this cross still to bloom, and since all have small foliage, all will probably be miniatures.

The writer has never been particularly fond of miniature *Amaryllis*, preferring bloom of 5″ to 7″ in diameter, but this new miniature flower is so attractive that he will have to add to his goals one of developing ruffled miniatures patterned after this one. Therefore, a number of crosses were made with it this year.

Many of the Striata crosses, made with the objective of securing recurrent bloomers, are also producing miniature flowers. Of the fourteen Striata crosses which bloomed this past spring for the first time, ten of them produced miniature flowers between 3″ and 4½″ in size, some with reflexed or ruffled segments and some of regular form. From a cross between 'Tangerine' and *A. striata fulgida* was secured one miniature with a flower 3½″ in diameter and of good though plain form. It was a clear pale orange in color, with a trace of green and purple in the throat, a rather beautiful flower, but it also refused to set any seed. Another of these Striata crosses, involving the Houdyshel orange scarlet hybrid, a white Dutch clone, and *A. striata fulgida*, produced a real miniature flower, only 3″ in diameter. This pale rose bloom was also quite ruffled, but the shape was not so good since it displayed the peculiar Striata ''swan's neck''.

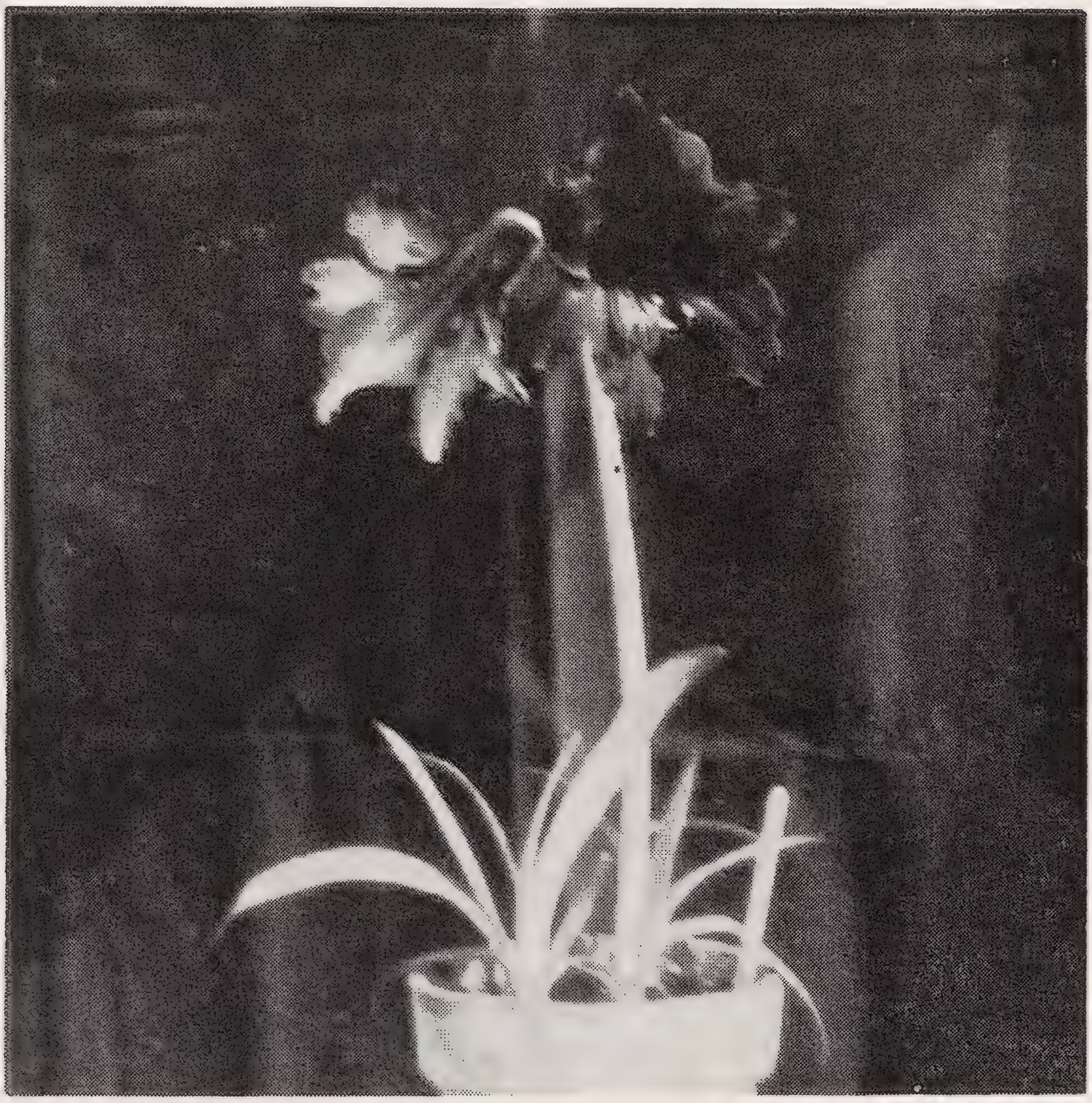

Fig. 23. New ruffled scarlet miniature **Amaryllis** hybrid raised by V. Roger Fesmire, Torrance, Calif.

Among the Peruvian Miniature Hybrids raised from seed by the writer is one that truly is a miniature. This one has flowers that are barely 3″ in diameter, white in color with the tips of the tepalsegs being a light rose, and with a green throat. In addition, this flower is definitely a long-trumpet type, which fact was not perceived until this spring. Now this might be usable in developing long-trumpet hybrids, for which there is a need. However, it has been the writer's experience with these Peruvian hybrids that they give very poor results when used as the seed parent, although they are satisfactory as a pollen parent. So far only one cross has been successful with this particular Peruvian Miniature, and the seedlings are growing very slowly. Pollen from an unidentified yellow long-trumpet species was secured from a friend and used on this miniature when in bloom, but it refused to set seed. However, all of these Peruvian Miniatures are good growers and next time the story may end differently.

In the summer of 1965, from a field of *Amaryllis* in the San Fernando Valley, some seeds were secured of what was apparently a self on a Diener hybrid crossed with white Dutch. Two of the plants raised from this seed bloomed for the first time this past April, and both produced well-formed flowers about 4½″ in size, one being a dull red in color and the other a rose red. These were shown to some friends, including Mr. Quinn Buck, who immediately identified them as Diener hybrids, even before knowing their history. *A. argilagae* was in bloom at that time in his greenhouse, and a cross was made between it and one of these Diener hybrids. Fortunately, it was successful, and this should give some real miniatures. The writer's bulb of *A. argilagae,* grown outside, bloomed at the end of June, but no crosses were successful.

Last year, every cross made with pollen from a Senorita hybrid was a failure. This year, using pollen from a different source, every cross made with it was successful, as were also the crosses made with pollen from a hybrid of Senorita X *A. calyptrata.* This experience corresponds with the observation reported by Mr. Mertzweiller in the 1968 Amaryllis Yearbook. In the opinion of this writer, these Senorita hybrids offer intriguing possibilities for developing a new race of graceful miniature *Amaryllis,* and so he was quite pleased to finally succeed in crossing the Senorita hybrid on to his previous hybrid of the Houdyshel orange-scarlet clone X *A. striata fulgida.* This cross was described in the 1968 Yearbook in some detail, and briefly referred to at the beginning of this article. Since the flowers are about the same size as those of the Senorita hybrid, and a salmon orange in color, some attractive pastel colors should emerge from this cross. He would also like to cross his new ruffled red miniature with the Senorita hybrid, but that will have to be a goal for next year. Anticipation is the motive for perseverance!

AN AMARYLLIS BREEDING PROJECT—1968 REPORT

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This report will be devoted to (1) amaryllis hybrids and species which bloomed for the first time in 1968 and a few notes in regard to progress in hybridizing, and (2) some comments on cultural practices in growing the species and hybrids.

1968 BLOOM SEASON AND HYBRIDIZING EFFORT

Six seedlings having the parentage SA 63-20 X *(A. evansiae* x *A. aglaiae)* bloomed in January and February, 1968. This cross was made in 1965 and the pod parent, one of Mr. Goedert's unidentified imports, has been described previously (PLANT LIFE, 1967, 1968). Of these six seedlings, four were very similar to the pod parent. Each bore one scape carrying two florets, medium pink in color, with form and markings very similar to SA 63-20. A fifth seedling made two scapes, one four flowered and one three flowered. These flowers were near white with a very slight pink flush. Unfortunately the flowers were not long-lasting and the substance left a lot to be desired. The sixth and best seedling was a delightful miniature with good substance and the most delicate light pink coloring. The single scape was two flowered. Even if no other good plants result from the 20 or more seedlings remaining to bloom, this one was worth all the effort of growing these seedlings.

This group of seedlings appears to have inherited the most outstanding characteristic of the SA 63-20 parent—a high degree of fertility. All attempted pollinations were successful. Most noteworthy was the pollination of the best pink miniature with 'White Christmas' and with *A. fragrantissima.* Pollen from *A. fragrantissima* was generously supplied by Fred Buchmann who bloomed this beautiful long trumpet species in 1968 and who reports on it in this issue. Although a good batch of seed was obtained from the cross with 'White Christmas', only two seedlings resulted. This experience parallels very closely the results of a 1967 cross in which 'White Christmas' was the pollen parent with *(A. evansiae* x *A. aglaiae)* x *A. evansiae.* This cross also gave only two seedlings from 50 or more seed. It may or may not be coincidental that 'White Christmas' was the pollen parent in both cases. Several dozen seedlings resulted from the pollination with *A. fragrantissima.* These seedlings appear to be very vigorous growers; at this writing they are only 6 months old and are already 6-8 inches tall. The potential for obtaining long trumpet or semi-trumpet vigorous hybrids in pastel pink or cream colors is most interesting.

Speaking of trumpet flowered amaryllis, the writer was fortunate to obtain a small bulb of *A. viridiflora.* This bulb was sent by Dr. Cardenas to Prof. Claude Davis. When obtained in the fall of 1967 the one inch diameter bulb was potted in a 3 inch pot. It remained completely dormant until May, 1968, at which time it sent up a bloom scape. The scape was two-flowered and the blooms opened late in May. These blooms appeared to agree very closely with the description of *A. viridiflora* given in the AMARYLLIS MANUAL, except that all of the dimensions were very much smaller than those quoted. The scape was two inches tall, the flower length 3½ inches, tube length 2½ inches, and diameter across the face of the flower 1½ inches. This miniature size probably is a reflection of the very small size of the bulb. There is little doubt that this is the true *A. viridiflora.* Unfortunately, because of the very late period of bloom, there were no other amaryllis hybrids or species on which to use the pollen of *A. viridiflora.* So an attempt is being made to preserve this pollen for an entire season by dry freezing. It will be used during the 1969 bloom season on hybrids and species which are known to be good seed setters.

To produce yellow or near yellow hybrids in various forms and sizes remains a noteworthy objective. Many amaryllis enthusiasts think in terms of large-flowered yellow hybrids of leopoldii form. Still, there is much to be said in favor of the smaller flowered yellow hybrids. At the spring, 1968 meeting of the Louisiana Society for Horticultural Research held at the University of Southwest Louisiana, there was in flower in the greenhouse a most beautiful small yellow hybrid from the breeding efforts of the late Prof. Ira S. Nelson. This hybrid was of an iridescent buff-yellow color, very full in form, but only about 3½ inches across. The parentage was *A. evansiae* x *A. aglaiae.* To say the least, this hybrid ''stole the show'' from many larger and unusual hybrids. This served to reinforce the efforts which this writer is devoting to breeding two lines of small yellow hybrids. One line is to be predominantly *A. aglaiae* with a small amount of *A. evansiae,* and the other line predominantly *A. evansiae* with a small amount of *A. aglaiae.* It is believed that both lines will be more vigorous and easier to grow than either of the species. It should also be possible to segregate form and color variations. The program was started in 1967 with a cross of *((A. evansiae* x *A. aglaiae)* x *A. evansiae)* X *(A. evansiae* x *A. aglaiae)* and was continued in 1968 with a cross of [*(A. evansiae* x *A. aglaiae)* x *A. evansiae*] X *A. evansiae.* Even though both groups of seedlings are quite small it is easy to detect significant differences in foliage characteristics.

A limited amount of breeding stock having potential for producing large-flowered yellow hybrids is gradually becoming available. One of the two seedlings having the parentage [*(A. evansiae* x *A. aglaiae)* x *A. evansiae*] X 'White Christmas' is showing excellent growth and has made a few offsets. Mrs. Herbert Kelley has given the writer two seedlings derived from 'Chastity' (white from India) X *A. evansiae.* Dr. Traub has kindly furnished some seedlings derived from 'White Crane' X *A. aglaiae.* Most of this stock is at least two years from bloom.

CULTURAL PRACTICES WITH AMARYLLIS SPECIES

After about 10 years of experimentation in growing amaryllis species and closely related hybrids, this writer has progressed to the point where losses by rotting of the bulbs are infrequent. Most recent losses have resulted from excessive watering of bulbs in a weakened condition due to having matured seed pods. It is therefore appropriate to pass along to others interested in growing species those observations which are felt to be most important.

All the observations can be put in the form of two rules (1) pay strict attention to all facets of the potting operation, and (2) water very sparingly or not at all during the period of dormancy or semi-dormancy.

The most critical features of the potting operation are (1) pot size and (2) potting medium. It is a serious mistake to pot a small bulb in a large pot. For bulbs less than one inch in diameter the writer uses a two-inch pot; for bulbs 1-1½ inch in diameter a 3 inch pot is used, and for larger bulbs a pot not more than 1½-2½ inches larger in diameter than the diameter of the bulb. Clay pots are used in preference to plastic pots. For the past year experimentation has been underway on use of the foamed polystyrene drinking cups for potting small (one year old) seedlings. These cups are about 2½ inches in diameter at the top, about 3 inches deep and are quite inexpensive. Two triangular shaped drainage holes are cut in the sides at the bottom; the cup is filled to a depth of about ¾ inch with small pea gravel before adding the potting medium. In addition to economy, these plastic cups will not allow the medium to dry out as fast as clay pots and it is therefore not necessary to sink the cups in soil or any other medium to prevent rapid drying out. The results to date (8 month test) with these plastic cups are very promising, but longer term testing will be necessary before they can be fully recommended.

A high porosity potting medium capable of perfect drainage and good root aeration is essential to success in growing amaryllis species. The potting medium currently being used by the writer is as follows:

COMPONENT	PARTS (VOLUME)
Good grade of potting soil	2
Vermiculite (Agricultural grade)	2
Coarse sand	1
Dehydrated manure	1
Steamed bone meal or oyster shell flour	⅓

The components are mixed thoroughly in a suitable container. This potting mixture has been in use for two seasons and has performed well; it gives excellent porosity and drainage. Note that use of peat moss is avoided. Peat moss results in excessive sogginess and is felt to have contributed to much of the bulb rot experienced in earlier years.

As already mentioned, small clay pots dry out very rapidly in the 95° summertime temperatures in this location. Daily watering is a virtual necessity. Sinking the pots in our heavy clay soil is undesirable because of poor drainage during periods of excess rainfall. To overcome this problem the pots are set on the ground and the space around the pots is filled with a mulching material such as sugar cane bagasse, pine straw or leaves. An alternate method is to set the pots in old fruit crates and completely fill the areas between the pots with the mulching material. Six to fifteen pots can be set in a single crate and this makes for easy portability. When the clay pots are protected in this manner, watering every 3-4 days is sufficient.

All of the *Amaryllis* species and hybrids go into a period of rest after having made a season's growth and prior to blooming. This rest period varies from a cessation of growth as in *A. evansiae* to complete dormancy as in *A. cybister.* It is during this period, which normally occurs during the fall and winter, that great care must be taken not to over water. If water is withheld entirely the worst that can happen is for the plant to go completely dormant. Too much water is almost certain to cause rot with many species and hybrids.

HYBRID VIGOR IN AMARYLLIS

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For the past fifty years our gardens have contained many *Amaryllis* clones. When Dutch bulbs became available after World War II, a breeding program was undertaken. Mature bulbs were dug in early September, put in cold storage for five weeks at 55° temperature with humidity controlled (PLANT LIFE, 1954), and the blooming period began at Thanksgiving with pollinating and seed maturing at an early date. This coincided with the arrival of new improved bulbs from Holland and new pollen and pod plants.

In retrospect, for the past decade much of the successes resulted from the advice and path led by a gentle, knowledgeable man, Prof. Claude Davis, who distributed Dutch clones and species collected by Dr. Martin Cardenas and the late Dr. Ira Nelson.

A whole new horizon opened with Dr. Ira Nelson's contribution including species collected in South America in 1954 and 1958 and made available with their hybrids through The Louisiana Society For Horticultural Research. His belief and encouragement centered on obtaining vigor through hybridizing species with seedlings more adaptable to outdoor cultures in Southern gardens.

The following crosses have been made: *A. evansiae* X 'Nivalis'; *A. evansiae* X 'Maria Goretti'; *A. evansiae* X 'Christmas Gift'; *A. evansiae* X *A. aglaieae* X *A. evansiae* X 'Nivalis'.

The yellow hybrid known as 'Morris Yellow' (PLANT LIFE, 1968) was used as the pollen plant on the above white Dutch clones. Similar crosses were made using *A. evansiae* pollen on 'Picotee'.

A similar program was followed in using *A. evansiae* and 'Senorita' pollen on some of the pinks such as 'Flora Queen' and 'Dutch Belle' which resulted in new hybrids of beautiful pink florets similar to 'Fairyland' bearing four florets to the scape of 7½ inches in size.

The growing and hybridizing of *Amaryllis* species and hybrids as influenced by Dr. Ira Nelson and others has resulted in Louisiana, especially in the Baton Rouge area, of new and different types of flowers as reported by Fred J. Buchmann and Joe K. Mertzweiller (PLANT LIFE, 1968). One other grower, Mrs. T. K. McKnight, has thousands of *Amaryllis* growing outdoors year round with plants of *A. striata* crosses showing exceptional vigor and numerous off sets.

During the severely cold winters here in 1962, 1963, and 1964, we experienced temperatures as low as 9°. These hybrids survived with pine straw or bagasse mulching.

This past spring we obtained from the hot houses at the University of Southwestern Louisiana *Amaryllis* pollen of *A. evansiae* type, pink hybrid type, etc. and used this on corresponding large Dutch clones and large whites and 'Picotee' flowers. The result was almost 100% in setting seed. At this writing the seedlings now are growing vigorously showing at least three leaves on a nice size bulblet.

There has been a considerable exchange of plants and pollen this past season, and several hard to obtain species, *A. yungacensis, A. forgetii,* and *A. pardina* were received from Dr. Martin Cardenas of Bolivia and distributed by Prof. Claude Davis. This will certainly help increase the interest in species and hybrids in this area.

Some notes on growing are: Work the topsoil with rotillers. Then railroad cross ties are used as retaining wall material to allow a top fill of six to eight inches of mixed peat-moss, manure, and coarse sand. This allows the seedlings to be high and dry. Plants are watered when rain is absent and liquid feed is given every three weeks. Species are put (in their pots) in similar beds shaded by pine trees. Shaded plants bring better flowers next season. All potted species are returned to a heated hot house in November before the first frost and ''put on the wagon'' with very little water till the next scapes appear.

One fringe benefit in our search for pollen and species is the new friends we've made who have helped generously in so many ways.

PLATYASTER AND STENASTER CROSSED WITH CODONOCRINUM

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Dean William Herbert reported several crosses between *Crinum* species which are placed in different subgenera. Surprisingly he found several of the hybrids fertile and raised second generation hybrids. Recently, with the cooperation of Mrs. Grace Hinshaw, Thaddeus Howard and Charles Harris the writer had occasion to examine a number of these plants and repeat some of the crosses. Nearly all of the combinations have been found hardy, free flowering and fertile. We submit the following comments:

The first *Platyaster* x *Codonocrinum* cross which came to our attention was Elizabeth Lawrence's 'Miss Elsie', a *Crinum americanum robustum* x *bulbispermum alba* cross (see Plant Life 1962, pg. 90) which we have repeated. It is an old and very common garden plant in South Carolina, as it is extremely hardy. It sometimes sets seed, but the pollen is quite viable. A sibling cross of smaller stature is 'Seven Sisters'. It occurs where *C. americanum* is the seed parent. Thad Howard has backcrossed 'Seven Sisters' onto a broad petaled *bulbispermum alba*. The resulting hybrid 'Ollene' produces blossoms with the erect patent features of *C. americanum* although the tepalsegs are nearly elliptical. Unquestionably 'Miss Elsie' and 'Seven Sisters' are promising breeders.

A cross known as 'Martha Washington' appears to be *C. americanum* by *C. powelli albaum* (The latter has very viable pollen, try it.) 'Martha Washington' has wider tetalsegs than 'Miss Elsie'. As the name indicates it is snow white. *Crinum* 'Catherine' is smaller in stature than the others above and as it produces semi-elliptical tepalsegs the feeling is that it is *C. americanum* by *C. giganteum* (*C. jagus* according to Hortus III). The blossoms are distinctly intermediate between these two species.

The first colored *C. americanum* hybrid to be encountered was Mrs. Hinshaw's 'Elina'. *Crinum* 'Cecil Houdyshel' was the pollen parent. The blossoms resemble a small pink peony with slender elliptical tepalsegs. Recently the writer flowered a richly colored *C.* x *digweedi* Herbert, a cross of *C. americanum* x *C. scabrum*. The blossoms are a vivid Chinese red to pink on the exterior; the interior of the tepalsegs are keeled a warm rose pink. The scape is a rust red-brown. It is one of the most striking hybrids grown in Florida (*C. submersum* Herbert excluded) and excepting for the few blossoms and spreading filaments would readily be taken for *C. amabile,* or *C. erubescens.* However the foliage fits neither.

Although the writer has produced many siblings of *Crinum* 'H. J. Elwes' *(americanum* x *moorei)* none appear willing to flower, thus we cannot report upon the viability or floral pattern, but with the exception of the *C. moorei* crosses which contribute a rosette of leaves not unlike *C. moorei* all of the other *C. americanum* hybrids have strap-like or slender tapering semierect leaves. Similarly, all have 5 to 8 semierect blossoms with patent or flat ray-like tepalsegs which are about ¾th inch wide by 2½ to 3½ inches long. These are oblong or elliptical in shape, not lanceolate. The pollen is always a deep golden yellow and most crosses exhibit a fragrant vanilla type odor.

In contrast the *Stenaster* x *Codonocrinum* hybrids have 12 to 25 slender, erect trumpet shaped blossoms and succulent, long tapering, semi-erect leaves. *Crinum* x *eboraci* Herbert is the type form but the writer has worked mostly with the clone 'June Harris' which is a cross of *C. asiaticum* x *bulbispermum roseum.* This pink flowered plant sets seed occasionally and the pollen is quite potent. Backcrosses onto the red flowered Kimberley *C. bulbispermum* are particularly vigorous seedlings.

Crinum x *eboraci* 'Zimmermann' is an *asiaticum* cross by *powelli album.* The clone may be lost to horticulture, but it was reported as fertile. Mrs. Hinshaw has a similar cross using 'Cecil Houdyshel' as pollen donor. The 'Twelve Apostles' group appear to belong to the *C.* x *eboraci.* This hybrid is slightly smaller in stature. The blossoms are brick pink which suggests a colored parent like *C. scabrum.* All variants have been found sterile.

The writer has crossed the dwarf *C. asiaticum* var *japonicum* and several forms of *C. pedunculatum* with various *Crinum* species and hybrids. Some show vigorous growth, others like the *C. moorei* crosses make a feeble effort. According to Herbert, his *pedunculatum-bulbispermum* hybrids were vigorous and freely viable. The writer can confirm the vigor, but the plants are still too small to flower.

As stated, all of the *Codonocrinum* x *Stenaster* crosses carry umbels with 12 to 20 or more blossoms which are slender erect trumpets in form. The flowers are not as showy or attractive as the patent shaped *Platyaster* hybrids. As far as the succulent upright foliage is concerned, it is rather unique in that it resembles that of an *Agave*. There is no known counterpart amongst the Crinum species which makes these hybrids easy to recognize.

With the exception of 'Twelve Apostles' all of the bi-subgeneric crosses listed above are fertile. The same appears to apply to other known hybrids of the same general type. There may be instances where seed may not form, or it aborts, but when pollen strikes without difficulty we consider the hybrid viable. Perhaps we should say "pollen viable". Because all of the above crosses involve remotely related species, the ability to be fertile is striking, particularly when one considers that hybrids between the *Codonocrinum* alone are nearly 50% sterile. In other words why should closely related or allied species give sterile hybrids and those remotely related fertile hybrids? In fact we are finding many of the wide crosses to be the most striking hybrids and we would certainly encourage the use of *C. americanum, erubescens* and *amoenum* with *scabrum,* the red flowered *bulbispermum* from Kimberley or *C.* x *grandiflorum* Deleuil.

AMARYLLIS EVANSIAE, MY INSPIRATION AND CHALLENGE

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It all started several years ago. . . . Dreams of a large, flat, green or yellow hybrid. . . .

My first *Amaryllis evansiae* was obtained from Mr. Wyndham Hayward, a large, nice bulb. It bloomed and I made an *A. belladonna* ♀ x. *A evansiae* ♂ cross. Result—not a large yellow or green hybrid but a small one I am pleased to have; one flowering in a 4-inch pot with two scapes to the bulb, four florets in the umbel.

Later I obtained tiny seedlings of *Amaryllis evansiae* from Prof. Claude Davis and coaxed one to maturity meantime losing Hayward's bulb but saving one of the offsets.

When I married Alek he contributed his two *Amaryllis evansiae* (K 730 from Davis and K 788 from Fairchild Tropical Garden). Later he received *A. evansiae* forma *flavescens* (PIM-13724), a very strong grower, and numbered it K 1068. K 1117 and K 1120 were given to my two clones.

In 1965 all bulbs flowered at the same time and pollen from K 1068 was used on K 788, K 1117 and K 1120. K 1068 was also pollinated.

Seeds ripened and were duly planted in very sandy soil with a little humus. When the seedlings produced the second leaf, I started watering twice a month with a solution of ½ teaspoon of "Hyponex" to a gallon of water; later changing to a teaspoon of "Hi-Gro" to a gallon of water.

In due time the seedlings were potted in a mixture of sand, humus and perlite and checked for perfect drainage. Seeds and seedlings of *Amaryllis pardina* that ripened at the same time were treated in the same way, and are doing well. All are grown under roof to control watering, with plenty of light, and are watered sparingly until they lose their leaves. Then, until new growth appears, they get only one watering a month.

When potting the smallest seedlings, I plant then in 2-inch pots in sphagnum and perlite to save space. They grew and grew out of the pots, and believe it or not, *A. evansiae* bloomed with as large scapes and flowers as their siblings in the 4-inch pots. If a bulb begins to rot, I clean and disinfect it and re-root it in sphagnum and perlite, The rerooted bulbs grow in this medium so fast and fill the pots with offsets, and the offsets and mother bulb bloom in the same 4-inch pot.

This year (1968), my bench was full of *A. evansiae* flowers of all sizes, shapes and colors, tailored and ruffled. *A. pardina* seedlings did not bloom yet. When *A. cybister* opened its octopus flowers, I used its pollen on the narrowest and longest segmented flowers of *A. evansiae.* The capsules are swelling—intriguing anticipation. . . .

I have also crossed the greenest *A. evansiae* seedlings with most green siblings, and the yellowest with the most yellow. I have selected a very wide and wavy segmented ivory colored one, and the palest one with a beautiful pink star in the throat.

All of these are so beautiful and really not hard to grow after one learns to keep them happy.

I hope my seedlings of *A. pardina* will be as diversified as the *A. evansiae* are; and have many different shades of background for the lines and dots.

POSTSCRIPT.—A quote from a friend's letter in Miami: "We went to . . . last week to see if there were any *Euphorbia lophogona* Lam. there. . . . However, I did see the clump of *A. evansiae* which George .... had discovered there a couple of years ago. It is not, surprising that they survive? Perhaps, the fact that they were forgotten and neglected is the answer. They are planted against a south greenhouse wall. The ground there is slightly raised and not only are the bulbs crowded because they have multiplied but they are also hemmed-in by other species of *Amaryllis.* I am sure they are never watered except when nature supplies it. They were not yet in bloom—only a few showed buds as yet. It is interesting to note, though, that they were all smaller than Mrs. K's—lack of fertilizer perhaps."—*Alek Korsakoff*

PLANT LIFE LIBRARY—continued from page 76.

LANDSCAPING FOR WESTERN LIVING, by the Sunset Editors. Lane Books, Menlo Park, Calif. 94025. 1968. Pp. 160. Illus. $2.95. This completely revised and up-dated profusely illustrated edition of a most popular aid to home gardeners in the Western States, will be welcomed. The topics discussed include the Western approach to home landscaping; effective landscape planning; gardens for dedicated and casual gardeners; remodeling an established garden; plans for hillsides and sloping lots; the garden as an outdoor room; and planting for a purpose. Highly recommended to all gardeners.

IDEAS FOR JAPANESE GARDENS, by the Sunset Editors and Jack McDowell. Lane Books, Menlo Park, Calif. 94025. 1968. Pp. 160. $2.95. The purpose of this excellent and profusely illustrated book is to provide ideas for an entirely new Japanese garden, or the modification of an existing garden with an Oriental touch. The topics discussed include the nature of the Japanese garden; the stability of stone; how to use plants; water creates new dimensions; paths and walks; how to enclose the garden; structures and details; Japanese ideas that work; and plans to get you started. This attractive book is highly recommended to all gardeners.

HOW TO GROW HOUSE PLANTS, by the Sunset Editors, and Barbara Pesch. Lane Books, Menlo Park, Calif. 94025. 1968. Pp. 96. Illus. $1.95. This very attractive and profusely illustrated handbook will be welcomed by indoor gardeners. The topics discussed include an introduction to indoor gardening; plants for foliage and blossoms; African violets; indoor-outdoor plants; succulents and cactus; bromeliads; orchids; pests and diseases; fluorescent light gardening; and year-around gardening. Required reading for all indoor gardeners.

HOW TO GROW AND USE CAMELLIAS, by the Sunset Editors, and an introduction by D. L. Feathers. Sunset Books, Menlo Park, Calif. 94025. 1968. Pp. 80. Illus. $1.95. This is an up-dated, profusely illustrated, practical guide to the use of camellias in western landscaping. The topics discussed include choosing quality camellias; how to plant and care for camellias; Bonasi; landscaping with camellias; propagation; corsages; and a camellia encyclopedia. Highly recommended to all gardeners.

HOW TO GROW BULBS, 2nd revised edition, by the Sunset Editors. Lane Books, Menlo Park, Calif. 94025. 1968. Pp. 96. Illus. $1.95. This book is dedicated to gardeners who want to know more about bulbous plants, including the scientific and common names. The topics discussed include the techniques of bulb culture; container culture; how to combine bulbs; flower arrangements; ten most popular bulbs; and encyclopedia of bulbs; pronunciation guide, and seasonal calendar. To this list the following bulbs should be added for California, **Rhodophiala, Eustephia, Chlidanthus, Calostemma, Eurycles,** etc. (see Traub, the Genera of Amaryllidaceae, 1963). This stimulating book is highly recommended to all gardeners.

EASY GARDENING WITH DROUGHT-RESISTANT PLANTS, by Arno and Irene Nehrling. Hearthside Press, 381 Park Ave. So., New York, N. Y. 10016. 1968. Pp. 320. Illus. $6.95. This beautiful, profusely illustrated book on gardening with plants that require a minimum of water fills a definite need. The topics discussed include, why a book on dry gardens?; designing drought-resistant gardens; soil improvement and garden maintenance; hardy trees; hardy shrubs, ground covers and vines; drought resistant annuals and perennials; desert flora; plants for container gardens; and conservation is everyone's problem. Highly recommended to all gardeners.

PLANT LIFE LIBRARY—continued on page 127.

4. AMARYLLID CULTURE

[REGIONAL ADAPTATION, SOILS, FERTILIZATION, IRRIGATION, USE IN LANDSCAPE, DISEASE AND INSECT CONTROL, ETC.]

PLANTING, FERTILIZING AND CARING FOR AMARYLLIS GROWN OUTDOORS

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1. TREATMENT ON ARRIVAL

Abrupt changes in temperature may occasion Amaryllis bulbs to start sweating in transit, so that they may arrive with some red spots, rot or moisture, around the neck in particular; rub the blubs clean with sand, then apply DURA DUST (50% D T T) but not on the roots, put them aside in a cool place for approximately 48 hours, allowing them to dry and then plant them.

Of course, you may cut away any rotten part of the scales, or wash the bulbs clean under a running water faucet, using your hand to twist off the rot, but such treatment should only be applied when the bulbs should arrive in very bad shape, so that it will only be necessary in very exceptional cases.

If something bad should actually have happened to the bulbs in transit, send in your claim to the suppliers, as the bulbs have been insured against all possible risks and dangers. When receiving bulbs without roots, use a rooting medium around the foot or at the basal plate as some say; if this is done when planting, it will help a great deal.

2. REMOVAL OF ROOTS

It is extremely important for Amaryllis bulbs to keep their roots. Of course, some suppliers from other parts of the world, where Amaryllis are grown in the open (great changes in temperature between day and night may easily cause Amaryllis bulbs to lose their roots), have great difficulties in getting well-rooted bulbs, so that they cut off what few roots the bulbs have, asserting that Amaryllis should develop new roots every year. Only the latter part of their assertion is true, for the Amaryllis bulbs should flower on their old roots, after which they should develop new roots; the two or three scapes take a lot of substance out of the bulb, but less, if the bulb is helped by the old roots. So only cut off the dried-up parts of the roots and the roots that have entirely shriveled up, but leave the good, healthy and strong roots alone.

3. REMOVAL OF SCAPES

Some people remove the first scapes that appear to give the bulbs a better change to survive and to acclimate; this is not necessary at all, if the bulbs are well-rooted.

4. ROOTING

As stated above Amaryllis bulbs should develop new roots every year again after they have done flowering; if the old roots are still on the bulbs, when they are planted, the flowering process will take less substance out of the bulbs, which should afterwards be well-fed to help them develop new roots and new substance. (often Amaryllis bulbs feel like sponges, when they have flowered).

5. PREPARATION OF AMARYLLIS BED

Remove completely 14″ of the existing soil; then fill the open space with soil preparation as listed below and bring the top of the bed 4″ above the surrounding garden area. By doing so, you will ensure good drainage at the same time provide 18″ of proper soil to grow the Amaryllis in. This bed preparation is a ''MUST'' to have success in growing Amaryllis in the open ground.

6. SOIL PREPARATION (MIXTURE) FOR ABOVE BED

⅓ Leaf mold (preferably of two years old beech leaves, but at any rate a mixture that has a pH of approximately 6/7, though the pH may be reduced by pure sphagnum peat moss, see below).

⅓ Sharp sand (the same as concrete sand).

⅓ Pure Sphagnum Peat Moss; to which mixture you may add 15 Pounds of Bone Meal for every 25 square feet.

REMARK I: *Pure Sphagnum Peat Moss.* (hydrated . . . 98% Organic—pH 3.5). A good product of Canadian origin and ideal to get down the pH, which is generally too high, is said to be imported by WESTERN PEAT CO., 5800 Monroe Street, SYLVANA - Ohio and your dealer could no doubt get it for you.

REMARK II: *Leaf mold.* The use of leaf mold found close to the coast is somewhat dangerous, due to the presence of salt caused by high water during hurricanes.

REMARK III: *Sharp sand* (concrete sand) is bountiful locally and has been washed, so there is no danger of salt.

REMARK IV: *For growing in pots:* ½ Leaf Mold; ½ Pure Sphagnum Peat Moss; a handful of Bone Meal for an 8″ pot.

7. WATERING

No overhead watering (especially not, when Amaryllis are in full bloom), except occasionally to get dust from leaves, if there has been no rain for some time, in which case a light mist spray is better.

It is always desirable to soak the bed in the late afternoon, as the *alkalinity* of the water is likely not to be so great that time of day, due to heavy use during the day.

The water supply is usually heavily treated with *chlorine* and with late day watering, this does not seem so strong. So you had better not water during the hottest part of the day (between 10 A.M. and 4 P.M.); as the sun rays are very intense during these hours, foliage damage may occur, if watering is done during these hours.

REMARK: Potted Amaryllis should be watered from underneath, placing the pot in a container until the top soil becomes wet. Regular watering always gives better results, never allowing bed or pot to become entirely dry.

8. SPRAYING

In early spring, when the bulbs start developing new foliage, spray with an insecticide or disinfectant (as strong as the local authorities allow you) to kill off as many insects as possible, for insects spread Mosaic Virus.

Spraying is of vital importance, when you spot *aphids* (greenflies or plantlice), in which case spraying will be necessary on a fortnight's schedule, as the disinfectant will kill the aphids, but not their eggs. For safety's sake the spraying may be recommended to be repeated five times; it will make your yard a pleasanter place to be in, for most insects do not just bother Amaryllis plants.

9. MOZAIC VIRUS

Plants suffering from the disease, should be removed relentlessly, as there is no cure possible; if they are overlooked, the insects will spread the disease, and all your valuable Amaryllis plants will soon be infested.

10. FERTILIZING

Fertilizing should also be done on a schedule. Fertilize each one with *OIL EMULSION* (containing fish oil) or *LIQUID SHEEP, COW or HORSE MANURE.*

This feeding along with the Bone Meal already added to the above mixture will be sufficient for the growing months.

The beds should also be kept mulched all during the growing season until time to lift the bulbs in late fall. Foliage feeding, often applied to Lilies, is not necessary at all, if you fertilize in the above way.

11. LIFTING

Lift your Amaryllis bulbs in late fall for a rest, which will greatly stimulate the flower development within the bulbs; putting the roots in Sphagnum in large boxes with plenty of holes for air circulation; stacking them in a dry place. Though this implies a lot of work, it will give better results in my opinion, the more so as you have a chance once a year to do something about the Amaryllis beds. The soil should be refreshed once in two or three years at least, for the roots of Amaryllis plants infest the soil; sterilization or fumigation of the soil would be the solution, but wherever not possible, the soil should be replaced by fresh soil once in a while.

If you do not lift your Amaryllis bulbs, giving them a six weeks' rest, you should mulch them well to protect them from cold weather; some Amaryllis-lovers lost thousands of Amaryllis in one cold night. Lifting your bulbs has one more advantage, viz., the opportunity to check them for RED FUNGUS; if they suffer from the disease, clean them thoroughly, rubbing the red off with sand, applying a fungicide and drying them well.

SOME USES FOR SYSTEMIC PESTICIDES ON AMARYLLIDS

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For two years I have been experimenting with the use of systemic insecticides on amaryllids, particularly hybrid *Amaryllis.* Several hundred seedlings and mature plants are grown both outdoors and in a small greenhouse. These systemic poisons, which function by being absorbed and distributed in plant tissues, as well as by contact, have been very effective under several conditions. *With proper precautions against poisoning,* they are definitely useful to the amateur gardener.

My first experience was with Scope (no longer available) and Cygon CE-2, used as a foliage spray on plants outdoors. The active ingredient in Cygon is *O, O-dimethyl S-(N-methylcarbamamoylmethy) phosphorodithioate,* or *dimethoate* for short. I found this spray treatment very lethal to thrips, aphids, and spider mites. The long residual action permits the spray schedule to be simplified to about one treatment per month.

However, foliage sprays with systemics do not solve two very important insect problems. First, I consider the material *far too toxic for use indoors as a spray,* and second, foliage treatment has not controlled several serious infestations of plant roots.

About two years ago, an invasion of an extremely obstinate thrip-like insect came in, apparently on purchased bulbs. This insect, which looks like a microscopic gray fly that does not fly, was associated with a root-lesion nematode, or some similar microscopic worm. Either the worm is the larva of the insect, or they seem to support each other symbiotically. The worms gradually destroy the root system and basal plate of *Amaryllis, Sprekelia, Narcissus, Zephyranthes,* and other bulbs. A strong magnifying glass is required to see either invader.

I should have obtained professional identification of the pest, or pests, but my first thought was to eradicate the trouble quickly. Fortunately, I was successful and have no specimens left for identification. The successful treatment consisted of *soaking bulbs* in a dieldrin solution (1 teaspoon of 28 percent emulsible solution per gallon of water) for about an hour and a *soil drench* of systemics after roots start.

Once roots have been destroyed and nematodes have burrowed into basal plates, the soil drench seems to be ineffective. Bulbs must be cleaned and soaked in the dieldrin solution or a systemic solution before replanting. Soaking in a solution of one teaspoon of Cygon CE-2 per gallon of water for several hours seems to rid the bulb of nematodes, as does dieldrin.

After a new root system has been established, the best control treatment I have found is systemic granules watered into the growing medium. Several firms sell 2% granules of Di-Syston, a chemical similar to the one mentioned at the beginning of the article, including Green Light and Ortho. Used at the rate of one level teaspoonful per six-inch pot every two months, this material has kept plants clear of all insects, both on leaves and roots. When plants are free of pests, dosage can be reduced. Toxicity to the plants has not been serious, except on some Crinums.

I found an even more effective systemic pesticide to be phorate, again similar to the compound mentioned above. It is so toxic to humans that it is apparently not sold for amateur usage, but I should think it could be profitably employed by the large-scale growers. It is used widely by the commercial lily growers in the Northwest. Because of my chemistry background, a few pounds of Thimet, a version of the chemical made by American Chemical Company, were made available to me for testing. I received the 10 percent granules, and only about ¼ teaspoon per six-inch pot is sufficient. Mites, slugs, white flies, mealybugs, and caterpillers were controlled, as well as the nematode pest described above. The commercial growers should certainly consider this.

A very important side effect of systemic pesticides is the retarding of the spread of virus diseases. For over a year I have kept virus-infected *Amaryllis* plants (too valuable to destroy) in the same greenhouse with healthy plants without further spread of the infection. It is probably sufficient to treat only the infected plants.

Let me emphasize: *these materials are deadly poisons,* by swallowing, absorption through the skin, and breathing of fumes. Irrigation water dripping from a treated pot is one source of contamination.

Of other materials tried for prevention of root pests, nicotine was ineffective and lindane was less effective than dieldrin. Chlordane kills soil pests, but it has stunted *Amaryllis* growth everytime I have used it.

EXPERIENCES WITH AMARYLLIDS

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General. Outdoors a home-made A-frame was discarded because its roof panels were too low for my tallest plants. Rather than replace it with a standard greenhouse, I purchased a relatively inexpensive ''screen house''. This is a set of 12 upright aluminum-framed plastic screen panels, hinged together to form a 6 ft. high 13-foot diameter circle—123 sq. ft. floor space. One panel acts as a door. A domed top framework of tubes (7½ ft. high) is covered with vinyl. The entirety is anchored to bolts secured in the patio concrete. This provides shade, protection from insects, fresh air circulation and a reduced range of temperature extremes for my potted seedlings, which are on patio-style redwood tables and benches. A hanging chemically treated killer of flying insects eliminates unwanted pests which get in under the edges of the panels.

Indoors my small plastic film covered ''greenhouses'', with thermostatically controlled bottom heat and timed Gro-Lux lamps, continue to serve satisfactorily for starting seeds and bringing seedlings along to potting size. Flying insect killers hung inside these covered units control black flies.

Plants in plastic juice pitchers, when compared to those in standard clay pots or square plastic pots, continue to appear to have the strongest and healthiest leaf and root growth. So I changed from wooden seed flats to plastic dish pans approximately seven inches deep. Quarter inch drainage holes are drilled in the bottom. Over a layer of ¾-inch gravel and four inches of standard Amaryllis soil mix, the seeds are sown ½-inch deep in a two inch layer of Terralite. By spacing the seeds about two inches apart both ways, the seedlings can be left in the seed pans until their only and final shift into plastic pitchers, plastic pots or clay pots. This method seems to reduce time to flowering.

Amaryllis hybrids. When plants flower for the first time they are evaluated and either discarded or tried as pollen and/or seed parents. The following characteristics show pronounced differences: readiness to set seed, seed quantity and size, percentage of seeds which germinate, percentage of seedlings which have dark green leaves (versus pale green or albino), speed of early leaf growth, shape and size of leaves and bulbs, and root growth. During the winter of 1967 and the spring of 1968 the growth was generally less vigorous than usual, and the flowering season started later and ended sooner than usual; this year there were flowers only from 14 March to 6 May, with no winter or late summer flowering.

Amaryllis argilagae. Five bulblets, approximately ½-inch diameter, received in October 1966 from Dr. H. P. Traub, all have grown reluctantly. Only one has survived and is now in excellent condition under a Gro-Lux lamp indoors, with thermostatically controlled bottom heat. It likes moisture in the air, frequent watering and frequent feeding with weak fish fertilizer solution. Six leaves up to twelve inches long arch up from one to four inches over the rim of the plastic pitcher, the leaf tips drooping down from the horizontal to six inches below the pitcher's rim. Question: with that much droop, in their native habitat the leaf tips may be subject to rot unless soil drainage is very rapid, so how do they stand the high amounts of moisture the plant seems to require for best growth?

Amaryllis striata. There has been frequent year-round flowering indoors and outdoors. All are now outdoors in a bed with southeastern exposure. One plant is presently setting a seed pod resulting from a late June application of refrigerated pollen. Noticing that the leaves arch over flatly as described above for *A. argilagae,* I have watched them for rotting of the tips; it does occur, after the leaves have reached their prime condition and are beginning to decline.

Agapanthus. Both tall and dwarf blue, and tall white variations grow well in a southeastern exposure. While they will stand full sun and will flower readily so exposed, their leaf tips tend to dry out and the flowers fade more quickly. They set seed readily. Their requirements for food and water are not exacting; normal California weather conditions are suitable in almost all areas. This is a very popular plant here. I like the blue because it supplies a touch of cool color when it is most needed, during June and July. The white provides an excellent contrast.

Allium unifolium. So far I have not determined its optimum growing conditions. One group in full sun and one in almost complete shade did not survive last year's summer and fall heat, followed by a cold wet winter. Many can be seen growing vigorously and flowering well in my neighborhood; but many have also died suddenly for no obvious reason.

Brunsvigia rosea. This is one of Southern California's most commonly-grown plants. It will survive total neglect, needing only our winter rains and our dry summers. From seedlings sown in December 1960, I have many bulbs which should flower this late summer. Some are in partial shade under a small *Albizzia* tree, and some are along a walk on the southeastern side of the house. The latter had more vigorous leaf growth which stayed green longer; they seem most likely to flower first.

Chlidanthus fragrans. From three bulbs potted in March 1965, there was one flower in April 1966 and none since. They were transplanted to a shaded coldframe and set eight to twelve inches deep. Foliage growth has been vigorous, but there is still no sign of flowering.

Chlidanthus x traubii. Eighteen seeds received in July 1967 from Dr. H. P. Traub were sowed in conditions normally used for Amaryllis seed. Germination was good in four days, with each seed lifted up out of the soil on top of a single round stem. True leaves started up in three weeks. Then they suddenly wilted and died. A check showed that the soil below the seed level was normally moist; no reason for the sudden wilting was apparent.

Clivia miniata. This is also a very common plant in Southern California, where it flourishes in deep shade, either in beds or in pots, provided the soil is rich. Flower stalks normally appear in February, but often decide to show up all spring and summer. Seeds are set readily; they germinate very slowly.

Habranthus andersonii var roseus. From a quantity of seed received in October 1966 from Dr. H. P. Traub, germination was excellent in a standard Amaryllis seedling condition. When transplanted outdoors, many died. The survivors are growing well in a shaded coldframe.

Haemanthus katherinae. Excellent growth and annual flowering in June in deep shade. The flowers are spectacular. In August and September "rusty" quarter-inch circles appear on the leaves, which by then are well chewed by worms, grasshoppers and cicadas. When the leaves are making their new growth in May, the center whorls are apparently especially tasty. The plant's habit of pushing new leaf tips right up through the old stalks is interesting to observe. Mine have not yet set seed for me.

Hemerocallis. Seeds have been taken from my two plants, one a deep chrome yellow-orange and one a delicate pale yellow. Germination indoors has not been satisfactory for me, but seeds have germinated well when sown ½-inch deep directly in the shaded coldframe. This is a popular plant in Southern California because it withstands neglect, once established, and flowers freely under varying conditions of soil and exposure.

Hymenocallis narcissiflora. Several bulbs made fair growth in full sun, but did not survive a cold wet winter and two sharp frosts last February.

Lycoris squamigera. This is a very common plant in Southern California, where it produces leaves from February to June, then goes dormant, flowering with a naked scape in late July and August. Mine do very well in partial shade at the base of a small Olive tree.

Lycoris radiata. In a morning-sun-only exposure on top of a wall, mine grow leaves from November to June, then go dormant, flowering with naked scapes in late September. They have an excellent frilled shape, changing color from a terra cotta to a glowing deep crimson. Mine refuse to set seed.

Lycoris aurea. A grouping tucked under a Juniper tree's overhang, so they get only the early morning sunlight, have produced excellent leaf growth from late November to June, when they go dormant, flowering in mid October. While not very tall, mine have excited pleased reactions with their almost glowing deep yellow, frilled flowers. So far mine have not set seed.

Narcissus. I am still having fun with seedlings from 'King Alfred', 'Fortune' and 'Soleil d'Or'. Last February several more flowered for the first time; two of these will be kept as breeding stock. Seeds germinate readily when sown ½-inch deep in a shaded coldframe. After they flower, they are lifted and moved to a permanent location, where their ability to survive neglect is checked by leaving them in place the year around, watering them only when nearby plants are watered. Thus far, several have shown a tendency not only to survive but to thrive and multiply.

Nerine crispa (undulata?). In a southeastern exposure, mine have excellent leaf growth the year around. One plant surprised me by flowering last February. It had a brick-red flower on a twelve inch scape. The flower was small and delicate, being only one inch across. It would not set seed when selfed.

Rhodophiala x huntiana. Several seedlings are growing well in a shaded greenhouse. From seed received in October 1966 from Dr. H. P. Traub, I had excellent germination in the usual conditions supplied for Amaryllis seeds.

Sprekelia formosissima. This plant is commonly grown here, often in full sun. It grows best for me in a southeastern exposure, where its flowering is sporadic, likely to occur almost any time from April through October.

Tristogma uniflorum violaceum. These have continued to grow and flower with no attention in a raised pocket in full sun. Their blue color is welcome in mid-February, with yellow Narcissus nearby. Those I have in partial shade in a coldframe have larger, brighter flowers. All go completely dormant after producing seed copiously in May and June. Those in the shade restart leaf growth in late July; those in the sun, in September.

Tulbaghia fragrans. Some plants I secured from the stock of the late Cecil Houdyshel grow readily in either partial shade or full sun, but leaf tips yellow in the full sun. Growth is almost lush, but both leaves and flower stalks are loppier than *T. violaceae.* It tends to flower most during the shorter days of fall and spring, with a non-flowering stretch from March through September. Their fragrance is a pungent but fleeting sweetness, best enjoyed from cut flowers brought indoors to complete their opening.

Tulbaghia violaceae. The constant succession of flower stalks all summer, continuing at a slightly reduced rate over the winter, makes this a popular landscape specimen in Southern California. Their steady output of violet flowers offsets their garlic-like smell that is released even by a breeze's stirring their leaves. The growth habit is neat, with a solid clump that steadily increases in diameter. They like generous feedings, but withstand almost total neglect. Although they stop flowering for a while when transplanted or divided, food and water soon force them into renewed growth and flowering. One of my seedlings is smaller than standard; its leaves are six inches long and its flower stalks are twelve inches tall. It flowers steadily from a tight neat clump.

Zephyranthes citrina. These pleasing plants grow and flower well in semi shade. Seed are set without coaxing, and germination is excellent. To gather seed you'll have to compete with any mice that may locate the plants; if given a chance, they'll chew an entire clump to soil level. Seed pods start to split in sixteen to eighteen days from pollination; after fourteen days, I pick mine and put the stalk in water under a lamp to be sure of beating the birds to the seeds. Germination occurs in twelve to fourteen days.

BLUE AMARYLLIS FLOWERED IN SOUTH CAROLINA

Charles J. Hudson, Jr.

Curiosity in the blue amaryllis *(Worsleya rayneri)* finally paid off last fall when my plant came into full bloom, producing six perfectly formed flowers with slightly ruffled edges, and of a bluish-lilac color (Fig. 24).

The bulbs of this plant are curiously different from most other members of the amaryllis group, having a long neck of 14 inches. The long, arching strap-shaped leaves arise out of the top of the long neck. The plant now has reached a height of four feet and is still producing new sets of leaves to form a fountain-like effect.

Obtaining *Worsleya rayneri* from its native habitat in Brazil was a long, time consuming task, mostly in getting clearances from the U.S.D.A. and in going through the customary fumigation treatment before releasing the bulb in this country.

When the bulb was first received it was potted in a good soil mixture, the same as used for standard amaryllis bulbs. The plant was placed in a lightly shaded spot in the garden all summer, and was then brought into the greenhouse in the fall for flowering. No trouble was encountered in the growing process since this plant thrived under the same general care given to amaryllis.

Mr. Harry Blossfeld, in a letter to me, dated January 6, 1968, indicated the difficulties of obtaining bulbs growing in their native habitats. He says, ''They are huge things, and a man cannot carry more than two big ones or four medium sized specimens from the dangerous cliffs where they grow, down to the nearest road. That is a neck-breaking work, and you cannot make more than four trips a day, which means that a day's drudgery will produce a dozen bulbs. Then comes the red tape in shipping them, which will take a week running from one government office to the other to join a dozen distinct licenses necessary to ship live plants. And then comes the risk of fumigation treatment at Washington, D. C. in the U.S.D.A. bureau of Entomology''.

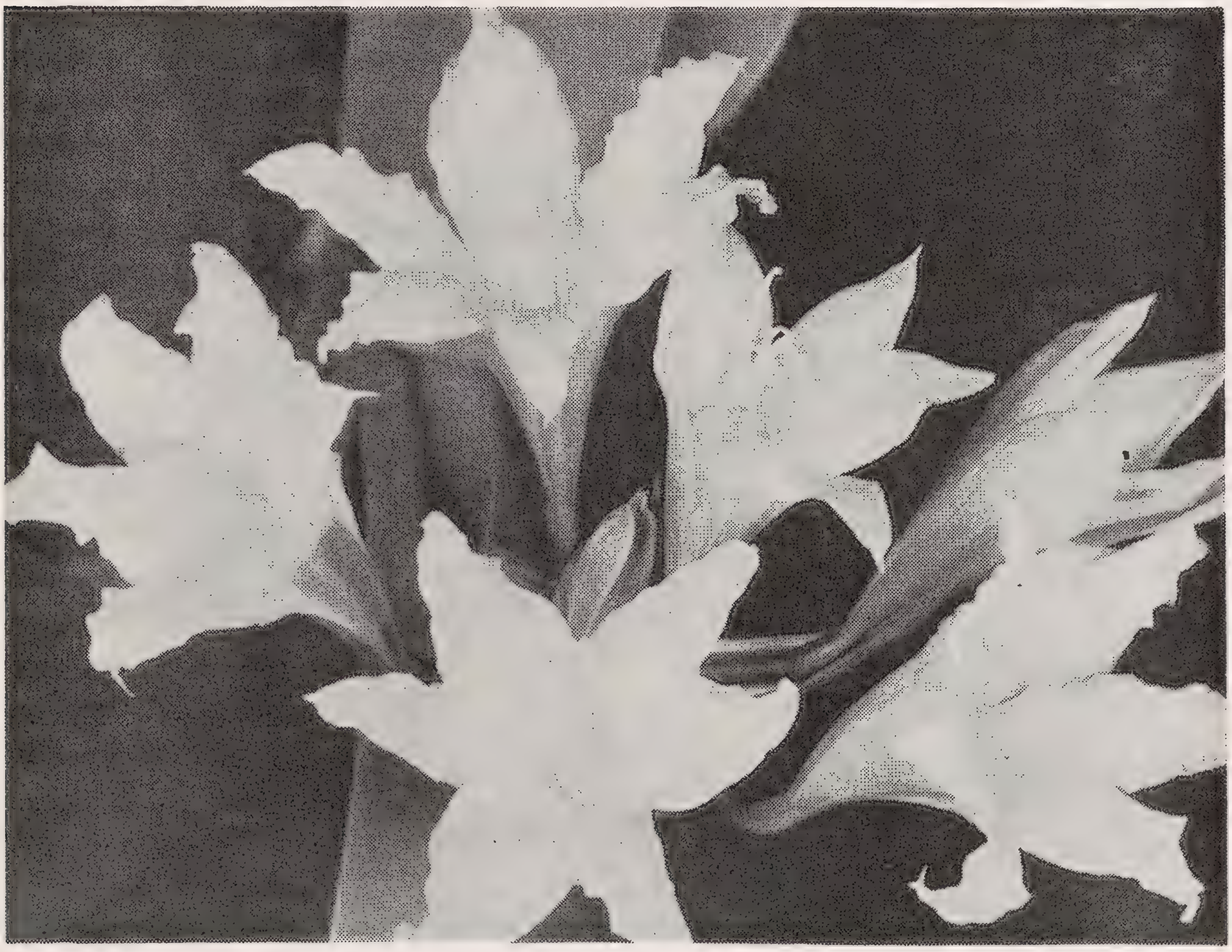

Fig. 24. The Blue Amaryllis, **Worsleya rayneri,** as flowered by Charles J. Hudson, Jr., in South Carolina.

From this information it is doubtful that *Worsleya rayneri* bulbs will ever be available in the United States at reasonable prices unless stock is built up from seedlings grown in this country.

GROWING **BRUNSVIGIA** X **PARKERI** IN LOUISIANA

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In midsummer of 1966, L. S. Hannibal sent me a collection of bulbs of *Brunsvigia* x *parkeri* W. Watson ex Traub. They were planted in my *Amaryllis* L. (syn. *Hippesstrum* Herb.) plot which is covered with shade cloth that allows 50% sunlight. Late that summer the bulbs put up flowering scapes and bloomed beautifully. The vegetative growth through the winter of 1966-67 was exceptionally good, but the bulbs gave practically no flowers in 1967.

Again, in the growing season of 1967-68, the bulbs grew exceptionally well, increasing in size and number. When the foliage died down in April of 1968, the bulbs were dug and stored in a dry place for the summer. They were replanted in August 15th and now, in mid-September, they are blooming exceptionally well.

It appears that *Brunsvigia* x *parkeri* must have a dry rest period during the summer months as is the case under natural conditions in the native habitat of the *Brunsvigis* parents in South Africa, where they do so well, and in California with a similar climate. My experience of one season is not necessarily conclusive, but it leads me to believe that *Brunsvigia* species and the hybrids such as *Brunsvigia* x *parkeri* may prove to be satisfactory for the humid Gulf Coast Region provided the bulbs are dug and given storage through the summer months.

Thus, by employing the summer bulb-storage method, the two Cape Belladonnas, the lower growing late-flowering, deeper pink, *Brunsvigia rosea* (Lam.) Hann. (see Plant Life 1963, p. 59); the taller early-flowering light pink species, *Brunsvigia major* Traub (see Plant Life 1963, p. 59), as well as the large number of hybrids in white, and many pink and red color shades and patterns grouped under *Brunsvigia* x *parkeri* W. Watson ex Traub, may be grown in the Gulf Coast Region. For a Comprehensive coverage of these last named hybrids see ''Catalog of Brunsvigia Cultivars'' by Traub & Hannibal, Plant Life 1960. pp. 39-62.

HARDINESS IN SOME **LYCORIS** SPECIES

NATHAN WILLIAM EASTERLY

Species of *Lycoris* are listed as semi-hardy bulbs in the trade catalogs. Nothing specific is given concerning the differences among the various species. My curiosity led me to plan an experiment to show differences in growth and hardiness among available species of *Lycoris.*

Two dozen bulbs were obtained of the following species: *Lycoris albiflora, Lycoris aurea, Lycoris ''cinnabarina,'' Lycoris incarnata, Lycoris radiata, Lycoris sanguinea,* and *Lycoris squamigera.* All bulbs were planted in 4 inch pots using a mixture of ½ soil, ¼ sand, and ¼ shredded peat. Six bulbs of each species were used as controls. Eighteen bulbs of each species were used as experimental plants.

The controls were grown in a small greenhouse (64 sq. ft.) at my home. The thermostat was set for 68 degrees F. during the day and 60 degrees F. during the night. The experimental pots were imbedded in soil of my bulb garden nearby with the rim of the pot at ground level. No protection of any kind was placed over the pots.

The experiment was run from October 1 to December 31, 1967. Three pots of each species were brought in every two weeks starting on October 21. The last of the bulbs were brought in on December 31. In the greenhouse the pots warmed up after a night in the warmer temperatures so I could make my observations of the plant's growth. The final observation on all pots in the greenhouse was made on February 15, 1968. I was looking for leaf production, first of all; next, the rate of leaf growth; and finally, frost damage or stunting of the leaves.

During October the day temperatures ranged from a high of 85° F. to a low of 45° F. The night temperatures ranged from a high of 66° F. to a low of 28° F. The day temperatures during November ranged from a high of 63° to a low 32° (two days). The night temperatures ranged from 54° to 16° F. Our major cold weather in November consisted of two days of 16° weather during the third week and two days of 18° weather during the fourth week. Although it snowed three times during the month, we had no ground cover of snow.

During the month of December the day temperatures ranged from 59° to 25° F. Seven day temperatures were below freezing. The night temperatures ranged from 41° to 3° F. Nineteen night temperatures were below freezing but only seven of these temperatures were below 20° F.

The results of the experiment are as follows:

Lycoris albiflora—All of the control plants grew vigorously from the start and produced many robust leaves. The experimental plants grew well from the beginning. The outside temperatures slowed up leaf production only slightly; no ill effects at all were caused by the 3° F.

Lycoris aurea—The control plants grew well but not as vigorously as *L. albiflora*. All of these plants were in good condition at the end of the experiment. The experimental plants grew well from the beginning but temperatures below 15° caused stunting. All of the plants, including the stunted ones, were growing well by February 15.

Lycoris "cinnabarina"—This plant is the poorest grower. Only two plants of the six produced any leaves at all and these leaves were dried up by February 15. The bulbs were saved to try again at a later date. The experimental plants produced different results. Pots brought into the greenhouse between November 15 (17° weather) and December 25 (26° weather) produced healthy plants with two or three leaves. Plants brought in before November 15 did not produce. Other plants were killed by the 9° weather on December 26.

Lycoris incarnata—The control plants were very slow in starting to produce leaves. During November the plants produced healthy leaves but the plants died back by February 15. The experimental plants exhibited the same growth pattern as the controls. The cold temperatures had no effect on the plant's growth other than slowing up leaf production a little.

Lycoris radiata—The control plants grew slowly but steadily from the start. All plants produced leaves which were healthy on February 15. The experimental plants exhibited the same results as the controls. No ill effect, not even frost bite, was observed on any plant.

Lycoris sanguinea—The control plants took very long (November 15) to show leaves. After that, the plants grew very well, produced two to four leaves, and were healthy on February 15. The experimental plants never produced any leaves outside but started producing leaves after November 25 in the greenhouse. The cold temperatures stunted the plants' growth but the plants were growing slowly on February 15.

Lycoris squamigera—The control plants did not show leaves until December 10. The plants grew well after that and were producing many leaves by February 15. The experimental plants produced no leaves outside but started producing leaves in the greenhouse after December 10.

Only *Lycoris "cinnabarina"* was killed by cold temperatures (9° F. on December 26). All other bulbs were in good shape on February 15. My previous experience with *Lycoris sanguinea* showed that I could not leave the bulbs outside during January and February. Note that the growth of *Lycoris "cinnabarina"* was enhanced by temperatures that ranged from 17° to 38° F.

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AMARYLLID CULTURE IN SOUTHWESTERN LOUISIANA—A PRELIMINARY REPORT

William W. Zorbach

Prior to the writer's move from Kensington, Md. to New Iberia, La. in June of 1967, all of his amaryllids were dug, packed in boxes with vermiculite, and shipped to his present location with his household goods. Included in the shipment were all those bulbs that were handled in pots, as well as a number of live plants, which did remarkably well despite the fact that they spent twelve days in a hot moving van without attention.

The sedimentary soils of southern Louisiana appear to be very rich but, being sticky in nature, require a good deal of conditioning to permit adequate drainage. Accordingly, a bulb bed was prepared along the south wall of the writer's new residence, in which much sand and peat moss was added to the soil, permitting the level of the new soil to be raised about 5″ with respect to the yard. Plantings were made and, because of the milder weather in Louisiana, the depths to which the bulbs have been set are considerably less than in the Washington area. In general, growth has been excellent, but soil fungus is a hazard, and a few losses from this have been encountered.

It has been rather dismaying to find that a number of amaryllids, which attracted much attention in the Washington area, are common garden plants here in New Iberia. This is true of the various hybrid crinums; ''Ellen Bosanquet'' appears to be the most common. It is of interest to note, however, that the gardeners in this area, who grow crinums, refer to them as ''lilies'', and it is my impression that they do not, for the most part, know the botanical names for many of the amaryllids grown here. which appear to be taken quite for granted.

Hymenocallis tenuifolia (also in the writer's garden) is common here and is completely hardy. *Hymenocallis galvestonensis* has nearly the status of a weed in this locale, growing well under conditions of poor drainage, with or without adequate rainfall. Synonyms here for this species are ''swamp lily'' or ''snake lily''. The writer dug a clump of these from the wild and replanted them in ordinary soil, and it will be of interest to see if they establish by next spring and give blooms.

In the past, the writer has read much about *Lycoris radiata* (red) in the South, and it is certainly true in this area. One sees them in almost every garden and yard, and clumps grow wild in uncultivated fields. They are especially attractive as border plants along walks and, as of this writing, their blooming period is just about finished. Both *L. radiata* (red) and *L. squamigera* were planted out by the writer after his move last year; however, neither have bloomed this year, which is not surprising, owing to the very long time required for each to establish. *Brunsvigia rosea* made excellent growth last winter, but of this writing has not bloomed, although the plants have been dormant all summer.

Crinum asiaticum, although not widely grown, is common here. The two large specimens, grown in tubs by the writer in Washington, were planted outside; each has since divided and the plants have grown magnificently this year. They are perfectly hardy and, although the foliage ''kills back'' in the winter, the bulbs have withstood temperatures at night as low as 25°F.

With regard to *Sprekelia formosissima,* it is a pleasure not to have to handle this species any longer as tender bulbs. These established rapidly on transplanting, and made good growth during the remainder of last summer and the fall (which reaches nearly to January). In the spring, the writer was rewarded by blooms, 4-6 at a time, lasting for about three weeks. They are, therefore, perfectly hardy, as are also *Habranthrus (robustus* and *brachyandrus),* which did very well this year.

Perhaps the most striking difference between southern Louisiana and the Washington, D. C. area is the onset of growing weather. Because of the early advent of spring here, the crinums, in particular, *C. powelli album,* bloomed in late April and early May, as opposed to mid June in Washington. The *Sprekelia,* planted directly in front of these, bloomed at the same time, and this proved to be an attractive combination.

In conclusion, it may be stated that there are, indeed, distinct advantages in growing amaryllids in this part of the country. Of course, it goes without saying that the sun is brighter than in northern climes, and the winters are milder, but also, sharp variations in temperature are not encountered and, in the summertime, adequate rainfall is provided, when the ''monsoons'' arrive. Hopefully, in the future, additional comments of more specific interest will be forthcoming.

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LYCORIS THRIVE IN WESTERN NEBRASKA

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[Editorial Note.—The following is excerpted from a letter received from Miss Vivian Grapes under date of September 30, 1968. This shows that two very beautiful **Lycoris** species are frost hardy in the North. Nurserymen, including Claude A. Barr, Smithwick, South Dakota 57782, are urged to propagate stock of these for general distribution in the North.—**Hamilton P. Traub**]

Thought you would be interested to know that the bulb of *Lycoris chinensis* you so kindly sent me in 1962 bloomed for me July 16, 1966, one scape with four flowers; and this summer, July 18, 1968, two scapes each with four flowers. I am so thrilled to have this beautiful *Lycoris* species to survive and bloom in Nebraska.

Lycoris caldwellii planted in 1958 first bloomed September 11, 1960, and produced two scapes September 9, 1967.

Both species are growing outdoors in my garden.

I would dearly love to try *Lycoris sperryi, L. kiushiana,* and other species making leaf growth in spring and early summer in the hope of finding others that are frost hardy in western Nebraska.

I am not having much success with *Lycoris* species that produce foliage in the autumn and winter.

[Editorial Note.—Those who have **Lycoris** species and hybrids which produce their foliage in spring and early summer are urged to send some surplus stock directly to Miss Grapes for use in her experiments in order to speed up this work with the objective of determining which **Lycoris** species are adapted to the extreme Northern climate.]

AMARYLLID EXPERIENCES IN FLORIDA, 1968

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Florida has been plagued for quite a number of years with lack of rainfall, but the season from September, 1967, to May, 1968, was especially dry and so amaryllis bulbs suffered much. Many lost their entire root systems and even though I watered all the beds almost continually it did not seem to do much good. Bloom was scarce for February, March and April which were cold months and this together with the drought made everything late. In May, however, things changed and we received 5.4 inches of rain, and it has continued to rain in quite large amounts almost every day since.

Outdoor *Amaryllis* bloom was late, the first bud opening on March 9. Many seedlings bloomed but I could not trace the origin of these since dogs and children have done away with all my markers over the years I have lived here. Not many Dutch bulbs bloomed but those that produced flowers were excellent. A seedling Dutch cross much like 'Belinda' produced three bud scapes and only a few produced two scapes. I was most happy to have one scape appear after such a dry season for I think I had only about 20% of my many bulbs to produce buds.

In October I ordered a number of new bulbs from Mr. Goedert. Since this was late for ordering I did not receive all that I ordered but Mr. Goedert always makes this up by sending extra bulbs, all of which were lovely, and were African bulbs. The only Dutch bulb I ordered was 'Tarakan.' For many years I have searched for a lovely black-red shade among the amaryllis listed and 'Tarakan' surely answers this description. It it very fine in both color and form and I can recommend it highly for those of you who like dark red bloom. I had some bloom on old *Amaryllis striata* in the house. It is much like the amaryllis they call ''the wild amaryllis'' here in Florida which blooms very profusely in protected places out of doors. Several Sundays we had huge bouquets of these ''wild amaryllis'' in Church and they were really breathtakingly lovely. I was given a dozen bulbs and I hope I have them planted in a spot where they will receive enough winter protection so that I will get bloom in February or March. Old *A. reginae* also bloomed in the house. It has been a shy bloomer for many years but seems to like its Florida home as this is its third blooming season here. Flower is called coral in shade and has no central spot or star but is much the same shade as old ''striata''.

Crinums bloom after the amaryllis are done and are very attractive in large group plantings. My favorites are ''Ellen Bosanquet'' and ''St. Christopher Lily'', the name given here to a *C. giganteum* Hybrid. None bloomed as plentifully as they should have done had our season been better.

Daylilies are rapidly gaining in popularity and are most gorgeous in all the new shades hybridizers are introducing. A friend of mine spent a hundred dollars for plants and will eventually have a lovely display along her lake front when they grow into larger clumps. Mine did not do as well as they should have since I had moved and rearranged them last year but I had some very nice ones. I especially like the new pinks and reds, but for a wonderful bloomer 'Sandalwood' produces many flowers over a long period and is very nice. I am fond of all the daylilies, the light yellows such as 'White Sails', the golden yellows, the deep orange and even some of the eyed varieties such as 'Varsity' tho these I do not care for as much as the clear colors.

Last summer (1967) I was called north in July by the death of my only sister so now I have no one here in Florida. She lived here but had gone north to spend the summer with her children up there. I I did not care to return home at once so visited a short time in Ohio. Friends at Columbus took me to Mansfield, Ohio, to visit the lovely Kingwood Gardens there. The day lilies were in bloom there and I wandered to my heart's content among them listing names of varieties I liked only to find when I looked them up that they were just too expensive for me to buy since I never know just how long I will live in this house. I kept the list and will watch for lower prices as they become more plentiful. Kingwood Center is a lovely place at any time of the year and well worth a visit if you are in that vicinity. Their many greenhouses have year round bloom and there is always something fascinating to enjoy.

Florida is so green and lovely now I wish you might all see it. Of course we have lots of electrical storms in the rainy season but our lakes are again filled with water and the lawns grow so fast it keeps everyone busy keeping them cut and trimmed. I hope all this rain will make my next amaryllis season the best ever.

FOUR COMMON "MILK & WINE" CRINUMS

L. S. Hannibal, *Fair Oaks, Calif.*

Four of our most attractive 'Milk and Wine' *Crinum* clones bear a striking similarity to each other and cause no end of confusion in identity. These are *Crinum submersum, grandiflorum, virginicum* and 'Empress of India'. All flower within a few weeks and have large, flat-face, open blossoms which bear typical *scabrum* markings of waxy white petalegs striped by a pink or red keel. In foliage and bulb there is a general similarity, and though the true *C. scabrum* does not have the slender foliage or elongated neck found in this group the bulbs inevitably are classed as variants or hybrids of *C. scabrum.* Actually only one contains *C. scabrum* blood and all are appreciably hardier. If it were not for some senior members amongst the bulb collectors we would be in a bad way attempting identities because these plants date back to the gay nineties and any written descriptions are as brief as the old catalogues.

The first bulb, *Crinum* x *herbertii virginicum,* was introduced by van Tubergen about 1885. We have no way of telling now if it was one of Herbert's original *C. bulbispermum* x *scabrum crosses.* It could be since he distributed samples to Dr. Carey in Calcutta as well as to other friends in tropical areas. If not, then it is a repeat of this cross. It has the foliage stature of a *C. x powelli,* but cleaner, more erect and slightly more succulent. The 24-inch scape carries an umbel of 8-10 open star-shaped blossoms which resemble an open flowered hybrid *Amaryllis* with pointed tepalsegs. These have pink keels against a white background; the margins are often ruffled. The tepalseg width at the heel of the limb is 1¼ to 1½ inches and the span of the blossoms are 7 inches or more. Usually 4 or 5 buds open each evening.

The second bulb is the old French hybrid *C. grandiflorum* from Marseilles which van Tubergen listed from 1896 to 1910. It is a cross of *C. bulbispermum* with *C. careyanum.* The foliage is noticeably less acutely tipped than *virginicum* and the tepalsegs are nearly linear having an approximate width of one inch; the tips are blunt. The flat faced blossoms have a span of 7 inches and typical pink keels. The blossoms tend to collapse to a trumpet shape and become campanulate on the second day. Some people call the plant *grandum* as Henry Nehrling used this name. Excepting for the slight differences noted in the tepalsegs and foliage shapes, *virginicum* and *grandiflorum* can be readily confused.

'Empress of India' has open star shaped blossoms like *virginicum* but the foliage spreads in a low rosette with the tips arching over to the ground. It may be a *Kirkii* hybrid as there is great similarity in the blossoms and foliage, however, the tepal tubes are quite slender. The breeder is unknown; both Reasoner Brothers at the Royal Palms Nursery and van Tubergen listed the bulb about 1905. It is not as hardy to winter cold as *virginicum,* but grows well in an 8 or 10 inch pot.

The last plant, *C. submersum* Herbert appears to have been introduced by Reasoner Brothers as *C. kunthianum* from Nova Granada on the western slopes of the Mantiqueira Mountains which lie back of Rio de Janeiro, Brazil. It resembles *C. scabrum* or *grandiflorum* with its broad glistening white petalsegs which are striped with deep pink or vivid red keels. The plant has been commonly confused with *C. fimbriatulum* or *C. zeylanicum* due to these floral markings, the acutely curved tepaltubes and declinate filaments—Features which are typical of the *Codonocrinum* subgenus. But the plant also has bright yellow pollen, and the blossoms are patent and have a strong vanilla fragrance. Moreover the foliage is bluntly tipped and closely resembles a broad leafed *C. erubescens* or *C. kunthianum.* All such latter features are common to the American *Platyaster subgenus.* Despite these widely conflicting features which caused Dean Herbert to wonder if he had encountered a transitional species, *C. submersum* is allied to *kunthianum.* The tepals are a good inch wide, linear-oblong in shape and completely patent giving flat faced blossoms of 7 inches span (See American Horticultural Magazine Oct. 1968) not unlike the other three 'Milk and Wine' garden *Crinum* already described. The plant differs from *C. kunthianum* by the larger size of the blossoms, their vivid coloring and the unusual *Codonocrinum* features including the sharply bent tepaltube. The foliage is broader at the base. We can attribute these unusual features, which are indeed transitional, to the misty year-around rains so necessary to the Coffee plantations about Rio. Similar transitional features are found in some forms of *C. erubescens,* likewise with some *C. flaccidum* growing along the Great Barrier Range in Australia. Evolution was not understood in Herbert's day but his writings indicate that he considered the *Crinum* forms with straight tepaltubes to be more closely allied to *Ammocharis* and *Brunsvigia,* thus he concluded that the *Crinum* with the curved tubes were an offshoot of the straight. This is in agreement with current views.

Apparently *C. submersum* is quite common in Florida. It throws numerous offsets and soon forms compact clumps. It does not need the aquatic conditions as Herbert assumed and is hardier than *C. scabrum* since the writer has grown bulbs out of doors through wet Sacramento winters for several years. We are inclined to believe that this is the plant Henry Nehrling refers to as *C. amabile* in his section in Bailey's Cyclopedia of Horticulture. (The true *C. amabile* resembles *C. asiaticum* and is four feet tall. It is surface growing and would freeze out in Florida.)

The writer has never heard of 'Empress of India' being fertile. The same applies to *virginicum* but other forms of *C.* x *herberti* have been reported as pollen viable on *C. bulbispermum* so it may have possibilities. We have ample proof that *C.* x *grandiflorum* is fertile as it has been crossed both ways with *C.* 'Cecil Houdyshel'. This suggests that *grandiflorum* may be a polyploid. There may be seedlings scattered about Florida. Unconfirmed reports exist that *C. submersum* has very viable pollen. We will try it for seed in Hawaii. The Kona climate would be perfect.

DAFFODILS—AUTUMN, WINTER AND SPRING JEWELS

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How many readers of bulb catalogs are aware of the introduction date of 'King Alfred'? In this jet-age it is surprising that a daffodil introduced in 1899 is still popular. That this is so is due to the lack of knowledge of what has been taking place in the daffodil world. True, careful selections made by reputable dealers over the years has improved the strain since it was introduced; however, it is away below the quality of the many new cultivars (varieties) on the market today. Breeders in Ireland, England, the Netherlands, Australia (including Tasmania), New Zealand, and the United States are responsible for the many fine things available today.

It is recommended that one begin a journey of discovery among the newer daffodils with the catalogs and pricelists as guidebooks. There are forms, colors, types and sizes now, that were not dreamed of in that gas-light era. One of these new developments are the reversed bicolors. These flowers have their tepalsegs darker than the trumpet, corona, or cup, and are enchanting things such as 'Honeybird', 'Entrancement', 'Spellbinder', 'Bethany', 'Daydream', 'Limeade', and 'Binkie'. These clones represent years of selective breeding by growers in Ireland and Oregon. Mr. Grant E. Mitsch of Canby, Oregon, has done more with this class than has any other breeder; not limiting his efforts to one or two divisions, but continuing this tremendous advancement of color into the smaller divisions, such as Division VII—Jonquil, with 'Pipit' and 'Verdin' available at present with the promise of more to follow. These are exquisite and very fine novelties.

If the thought of the yellow tepalsegs and white cups does not attract you, perhaps the pink cupped forms would, or the clear whites, or maybe the red cupped yellows. All are lovely and each garden should have a smattering of them to give it depth, and to provide a longer and greater enjoyment to all who are privileged to view it. Present day daffodils can be had in a wide range of blooming periods far greater than the two week span of the venerable 'King Alfred'. With a careful study of the catalogs, blooms may be had from late winter until late spring as not all flower at the same time.

Here, in southern California the season starts with that odd little species *Narcissus viridiflorus,* a green flowered jonquil with a heavenly fragrance, which is a fall bloomer opening well before Thanksgiving. The 'Paper-White' and 'Soleil D'Or', members of Division VIII—Tazettas, are in bloom from November through January. Other early blooming cultivars are the Cyclamineus hybrids of Division VI, 'February Gold' and 'Peeping Tom'; the red cupped member of Division II, Rouge; Mr. Mitsch's lovely pale trumpet 'Moonmist' is one of the earliest. These will be in bloom before February; from then on, until the poets close the season in late April or early May, daffodils can grace your garden.

A wind protected location which receives filtered sunlight through a spring flowering tree can be an ideal situation for raising daffodils. If one keeps in mind the scale of the site selected and is governed thereby in the choice of clones, the whole can become a jewel of garden planning, and the memory of which can sustain one through many a hot and trying day.

The requirements for culture are simple. A well and deeply dug soil, enriched at the lower level with humus and bulb food, low in nitrogen and non-burning such as the sludge derivatives. The bed should be prepared in late summer so that it will be settled and ready to receive the bulbs at proper planting time. Here, in southern California, that is in the later part of October and the first of November, or whenever the heat of summer has past and the ground remains cool to the touch, even at mid-day. The bulbs are planted at a depth two to three times their diameter, and are watered well after planting to firm the soil around them and to start an early root action. From then on, the beds are always kept damp. When the tips start showing through the ground, a side dressing of a liquid fertilizer of low nitrogen content is given; when the tips of the buds appear, a similar feeding is given.

If the fertilizer is acid in reaction, such as the 4-10-10 type used for acid loving plants, the color of the blooms will be improved.

Following the blooming period another feeding should be given, this one of a 2-10-10 or 0-10-10 formula to assist in the formation of hard sound bulbs for the coming season. A fertilizer high in nitrogen will produce more succulent bulbs, but in a hot climate this can be detrimental, as such bulbs are more prone to rot when left down during the hot summer months.

Should the drying foliage offend ones aesthetic sense, the planting of screening annuals may be practiced without detriment to the bulbs, provided one doesn't spear them with a planting trowel. Petunias and alyssum are excellent; they require little water during the summer and what is given is absorbed immediately, and they form a nice mat to keep the soil cool during the hot weather. As the foliage dies back, do not break, braid or twist it off, but let it age normally, for in doing so it is storing food and forming buds for the following season. To damage the foliage at this time is to destroy the blooms for the next year and to endanger the life of your bulbs. When the foliage is brown and prostrate, remove it with a slight tug if necessary to free it from the bulb. Where the leaves come through the soil round holes remain. Drop a few granules of insecticide down the holes and fill in with soil. This will discourage sowbugs, earwigs and the like from feeding on the dormant bulbs. When it is again cool in the fall begin watering the bulb beds and give them a good side dressing of bulb food as when planting. Tuck in a few blue violas or white primroses to add another facet to the daffodil setting, and soon another season will begin.

If a word about clones (often incorrectly called varieties) is needed, let it be said that the best is not always the most expensive. It is the newness and the scarcity coupled with the demand that governs the price.

Excellent examples in the Trumpet Division (I) are, in the order of their appearance, 'Artic Gold', 'Kingscourt', 'Gold Court', and 'Ulster Prince', all of which are yellow to golden yellow; of the pale yellows the first is 'Moonmist', with 'Inver' blooming a bit later, both are cool, clean and lovely. Bicolor trumpets are among the first of all to bloom and the clones 'Foresight', 'Lapford', 'Trousseau' and 'Prologue' are recommended. Perhaps, the finest bicolor to date is the elegant 'Descanso', but it is new and a bit high in cost. Pink trumpets are rare, but the bewitching 'Rima' is a ''Must have'' on anyone's list.

Division II—Large cupped daffodils—is the largest of all the divisions with the greatest number of types to choose from; from the deep gold of 'Ormeau' through to the pale tints of 'Lemnos' to the bicolors 'Polindra', 'Festivity', 'Green Island', 'Statue', and 'Irish Charm'. The gold and red cupped cultivars are 'Revelry', 'Red Goblet', 'Fire Proof', 'Ceylon', 'Border Chief' and 'Ballymarlow' to name but a few to whet the interest in these fiery numbers. This group and their companions, the red-orange cupped whites have the greatest carrying power in the garden. They shine like beacons and a wide selection is available including 'Arbar', 'Red April' and 'Kilworth'. The all whites include 'Ludlow', 'Purity', 'Arctic Doric', and 'Easter Moon', these are a bit costly due to demand but are most lovely. A characteristic of the whites seems to be the requirement of sharp drainage. If one wishes to have white daffodils without the expense of the higher priced sorts, it is advised that one plant the lovely and quite hardy triandrus hybrid, 'Tresamble'. Some of the most enchanting of daffodils are to be found in this, the Division V—Triandrus. Even their names are poetry, 'Rippling Waters', 'Honey Bells', 'Ivory Gate', 'Dawn', 'April Tears' and 'Rosedown', the latter being yellow as are 'Kings Sutton' and 'Honey Bells'.

The Cyclamineus, Division VI, include among the earliest and most distinctive of daffodils, with their wind-swept tepalsegs resembling the true cyclamen, but coming in yellows which the cyclamen do not. Valuable additions to the garden are 'Jenny', 'Dove Wings', 'Charity May', 'Bushtit', 'Wood Cock', 'Spring Peeper', 'March Sunshine', and the tiny and enchanting 'Mite'.

The jonquil derivitives of Division VII are among the most fragrant and bloom from February with 'Hesla' and 'Sweetness' through until the last of April with the smaller 'Baby Moon' and 'Baby Star'. Pink tinted jonquil forms are scarce, but 'Cherie' is available to all and an excellent one.

Specimens from Division III—small cupped daffodils and Division IV—doubles should be placed in a cool shaded spot with plenty of moisture as they are among the last to flower due to their close relationship to the poets of Division IX. The all white forms from Division III, 'Chinese White', 'Bryer', 'Silver Mine', 'Silver Princes', and reprieve are listed in many growers' catalogs and a few should be included in any collection. A pine tree makes an excellent foil for such as these and for the poets 'Actaea', 'Milan', 'Dactyl', and the late, late 'Sea Green', which is sometimes in flower as late as May. Yes, even here in southern California. The pine tree needles make an excellent summer mulch for the bed to keep the soil cool and provide additional acidity.

Not every one enjoys the large puff-ball doubles of 'Windblown', 'White Lion' or 'Sunburst', but few can resist the precise elegance of 'Acropolis'. While this clone is still in the novelty category, even new and finer forms are being bred in Ireland and Oregon. Mr. Murray W. Evans of Corbett, Oregon has been active in the development of hardier doubles more suited to the various climates of the United States than are the previous introductions from Ireland.

There are many more than can be listed here, some of which are as easy to grow as weeds, others are most difficult. But, which ever you prefer take the time to come to know them well and you will be rewarded.

THE 1968 AMARYLLIS SEASON

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Many seasons have passed since as many fine blooms were seen as during this past season. Especially fine reports were received regarding seedlings that flowered for the first time. Many are enjoying raising seedlings. Seedlings are interesting particularly as one can add many colors to his collection not available in named clones. The lighter colors, blends and bi-colors are very popular. Each seedling is an interesting individual and much satisfaction can be obtained in having a few to flower each year.

Some fans make their own crosses. This is interesting; however, if one does not choose the seed parents wisely the results will be inferior. It is wise to obtain the best seed possible because you are going to pet these seedlings along for 3 to 4 years and you surely do not want to be disappointed after spending many hours of watering and caring for them. While raising a few seedlings from your own crosses is interesting unless you have a large collection it is very hard to time the flowering period to have the exact two plants in flower at the same time (unless one cold-stores pollen). One should not waste his time on chance crosses when good seed can be obtained from a reliable hybridizer.

Whether you live in the north and grow your amaryllis in pots or in the south where they grow in the border I recommend trying a few seed each year. In three or four years you can have several new ones blossom each season. It will give you a lot of satisfaction and pride in its accomplishment.

CULTURAL RECOMMENDATIONS

Again this past season, as in most seasons, I received letters from those who dearly love *Amaryllis* but just fail in keeping them growing from year to year. Part of this failure, I am sure, is due to the lack of understanding of this plant. One must first understand that the commercial clones of amaryllis are hybrids. The exact requirement for each variety is a little different. In addition one must understand that most clones come from but a relatively few growers in Holland. The bulbs are raised in greenhouses under ideal conditions and since Holland is on a latitude with Canada, they have to provide heat even in the summertime to maintain a temperature of 68°F. This is the optimum growing temperature for some Dutch amaryllis. Few of us in the United States can duplicate this condition especially in the South unless we have an air conditioned greenhouse.

There is another factor we should recognize when we grow the Dutch clones. The Dutch hybridize to produce prime bulbs in as short a period as possible that will produce a fine flower when potted up. They do not breed for garden type plants, neither do they breed for pot plants that will flower year after year for you. We owe a great deal to the Dutch growers for their work on amaryllis for today I seriously doubt we would have the beautiful hybrids we have if it were not for them. They stubbornly and constantly worked with this plant when its commercial value was questionable. The Dutch are due a great deal of credit for their work with amaryllis; however many of the faults we find with todays clones, especially in the south, is our dependency on the Dutch growers for our bulbs. They are not as adaptable to our climate as they would be if we had local hybridizers and growers. This is a weakness that few fans understand or show much interest in changing. They just have not supported the American grower in the past.

In what I have said I do not mean to infer any discredit on the Dutch grower. The point I am making is that the faults we find with our amaryllis clones should be expected. We will never find a fully acceptable amaryllis strain to grow in Florida by depending on the growers in Holland. Neither could the Dutch depend on us to develop a strain commercially satisfactory for them. It just does not work this way.

We do need to develop improved hybrids for pot culture and for the border in our country. What will grow in the cooler dry, higher areas of California are not going to do as well in our warm wet coastal areas. Each area needs to develop its own strain. This is why I encourage all fanciers to grow a few seedlings each year.

I do not wish to encourage you to give up growing the fine Dutch clones for I never would do this and they surely are especially needed in hybridizing. The point I am trying to make is you can be more successful with them if you try to understand their requirements and not be one of those 'know it alls' who believe amaryllis are tropical plants and the hotter it is the better they like it. Try to understand how they are raised in Holland and try to duplicate these conditions as far as possible. One can improvise and I will try to give you a few hints I have found helpful myself.

I have grown many of the Dutch clones in the past 10 to 15 years. I have had many failures. I have had success with some clones the Dutch introduced and found they failed for them in a few years but here they thrived. You will find some Dutch clones will adapt themselves to your conditions much easier than others and some are going to fail. Of course I feel all the Dutch clones are worth the money even if we only get one flowering season from some. *You surely could not get anything nearly as beautiful in cut flowers from the florist for a comparable price.*

Here are a few points one should keep in mind when growing the Dutch clones although generally this is good for all others.

1. Most amaryllis hybrids do not like it too warm. 68° to 80° F. is best and I am told 70°F. is near the temperature the Dutch use.
2. Do not over water. The Dutch grow their amaryllis in beds or vats in the greenhouses where watering can be controlled.
3. Start with clean soil. Clean cultivation is essential.
4. Soil used should be slightly alkaline, open texture and rotted for two years if it contains much organic material.

5. Do not put large amounts of manure with your mixture. If you do you will have root trouble. Top dressing lightly with manure is better.

6. Avoid sudden changes in temperature of the bulb during the flowering season and during the growing season.

7. Try to keep your amaryllis growing through July and August for if you can they will make their best growth as the weather cools.

The trick is to find out how one accomplishes this in his own area. I will particularly comment on what I have found best in my area. First, I grow my amaryllis in pots. A porous pot will help cool itself from evaporation, especially if set up off the ground. I use tables with air spaces between each board. If the amaryllis bulb is planted well down in the pot and covered with a good insulating soil it will help. Lightly watering in the heat of the day will cool the plant. One should also give some shade but not too much. In a west exposure the ground apparently does not heat up quite as much. You may have other ideas.

Second, if you have amaryllis in a greenhouse or under cover do not over water. They will stand more dryness than wetness for if the soil gets soggy you will surely lose the roots and your bulb crop. If you have your amaryllis protected from the rain it is a matter of not over watering, but if yours are outside like mine and many others, I am sure, then you must guard against a steady rain which will flood the pot and may cause water logging unless you have excellent drainage. Drainage is getting rid of the excess water in the soil. Many factors are to be considered in this. Normally the larger the pot the better drainage you will need. You will need better drainage in a plastic non-porous pot than in a clay or porous pot. How do you get drainage? First you should provide an open textured soil that will hold some water and still drain sufficiently. You can have a soil too open textured which will retain too little water. However, normally the reverse is the case and you will have to take other precautions to eliminate excess water. One way is to use a clay or porous pot. A second is to reduce the size of the pot. This will foster drainage, particularly in a clay or porous pot but even in a plastic pot it will lessen the ratio of the volume of the soil and water to the bulb's ability to take up water. Planting more than one bulb to a pot will also help reduce excess water in the soil as two or more bulbs will take up water two to three times as fast as one. I recommend very strongly planting several bulbs in one pot. *Amaryllis* seem to naturalize in clumps and often a clump can cope with a prolonged rainy spell where a single bulb will lose its roots. I have found particularly with the species *A. belladonna* that once a clump has established itself it can cope with growing in damper areas where it ordinarily would not thrive. Once your bulbs have established a good root system they can stand a lot more water.

There are some advantages in a large pot. *Amaryllis* bulbs do not like sudden changes in temperature. The larger the pot the greater the mass and the longer the pot has to be exposed to a change in temperature before the temperature of the pot will change. Of course if you have controlled conditions this will not be a factor but in the open it definitely is. Planting several bulbs in a larger pot will insure better drainage and prevent the bulbs from being subjected to as much change in temperature. If you raise your amaryllis in pots in the open you must remember a hard rain will often wash away much of the food in the soil and you will have to fertilize them more often particularly after prolonged rains.

One should maintain clean culture. Start with clean soil. It pays to soak your bulbs in a good insecticide before planting. I also find drenching the soil of my potted amaryllis, about every 8 weeks, with a solution of Cygon and water very helpful. This is especially true if you have a plant that is not doing well and you do not have time to repot it. A drenching of Cygon and water will often start it back to recovery. Clean soil can not be over emphasized as it is where most of your trouble lies. In making up your soil if it has much organic material in it be sure it is well rotted. Green organic material especially if the soil is not well drained will rot your roots. If you can not control your water do not put much organic material in your potting soil. It is much better to add it later as a top dressing. Large amounts of manure in your potting soil should be avoided.

In planting amaryllis if they do not have live roots or have done poorly somewhere and you have dug them, washed them and are replanting them, if there is any doubt as to their being free of disease or insects, it will often be wise to cut the basal plate off even with the bottom of the bulb. This will cut away infection both from insect and fungus that often goes up into the bulb when the roots die away.

If your bulbs have good roots they probably are fairly free of insects and disease. When planting in this case pull off all damaged or dried roots. Fill your pot about half full of soil. Turn the bulb upside down and let the roots fan out. Then insert the bulb into the pot holding the roots in place letting them spread out up the sides of the pot and over the edge. Fill the pot and if you have the time tuck the roots hanging over the sides back into the surface of the soil. In forcing new bulbs I find using pure sphagnum moss in a Tuffy pot excellent. No fertilizer is needed until the bulb has flowered. I do add at times a little fertilizer to my watering when the scape is about finished developing and the flower bud begins to elongate. This gives the bud the extra boost to win the tri-color. Fertilizing before the bulb flowers will often bring leaves to the detriment of the flower. During the growing season your amaryllis need a steady supply of fertilizer. Liquid fertilizer is good but do not make the solution too strong. I do hope some of the things I have found helpful to me may prove helpful to you. One has to perfect his own method, however, as it is difficult to explain just what one does in raising his plants. Often one does not give all the little details that are important and again the one receiving the instructions often discounts the small details that are important. Well, anyway better luck next season.

I think we probably all get too excited over the new clones each season. But then again I guess we all need a little excitement in our lives and new amaryllis clones may be a harmless type of excitement although it may prove costly. I sometimes think we neglect to raise as many of the older clones as we should and spend too much time and money on the new ones. However again the new ones are the ones in which we look for improvement in color, etc. It is a great temptation.

AMARYLLIS CLONES

In reading over some of my comments on clones during the past several years it sounds like a record on the stereo that just keeps playing over and over. So this year I would like to give you a 'Quicky' list on some of the older clones and a few new ones that have done particularly well for me. Here they are!

WHITE: 'Marie Goretti', 'White Christmas', 'White Giant', 'Flying Cloud', 'Queen of the Whites' and 'Oasis'. PINK AND WHITE: 'Apple Blossom', 'Love's Desire', 'Pygmalion', 'Rose Elegance', 'Rose Marie', 'Little Diamond', 'Floriade'. SALMON & WHITE: 'Maragret Rose', 'Sweet Seventeen', 'Day Dream', 'Loveliness', and 'Mozart'. ORANGE & WHITE: 'Pinksterflower', 'Golden Triumphator' and 'Glorious Victory'. LIGHT PINK: 'Flora Queen', 'Eastern Dream', 'Dawning' and 'Dutch Belle'. MEDIUM ROSE PINK: 'Pink Favorite', 'Fritz Kreisler' and 'Daintiness'. PICOTEE: I like them all, some difficulty with some but new clones are improving. WHITE STRIPED RED: 'Peppermint', 'Orion' and 'Schubert'. RED & WHITE HEART: 'Hellas' and 'United Nations'. BRIGHT RED: 'Loberia'. MEDIUM RED: 'Ludwig's Scarlet', 'Scarlet Leader' and 'President Kennedy'. DARK RED: 'Vintage', 'Purple Queen', 'Ludwig's It', 'Belinda', 'Bernice' and 'Tarakan'. ROSE: 'Rubra', 'Rosedale', and other African varieties. DARK ROSE: 'Violetta', 'Morena' and 'Bordeau'. ORANGE: 'Orange Wonder' and 'Tangerine'. SALMON: 'Beautiful Lady' and 'Salmon Giant'.

You can compare this list with your list and I am sure it will be very interesting to see how they compare. Of course I did not name all the good ones but these happened to stand out in my memory at this time. I am sure I could add others as well as I know you have your favorites. I am sure many of us have our own favorite seedlings also. I know many of you have unnamed clones you would not part with and I also have many. Once in a while I like to talk about these as I feel sure you do about yours.

MY UNNAMED SEEDLINGS

First I would like to comment on the parents of the hybrid I call ''Leopardina''. This is a coined name for some hybrids I have that, in my opinion, are closely related to *A. leopoldii* and *A. pardina*. The parent stock of most of the ''Leopardina'' hybrids are three clones. One I call ''Bloody Mary'', another ''American Beauty'' and a third ''clone No. 700''. I do use the seedlings of these clones for breeding but mostly the ''Leopardina'' hybrids are from these three clones. You might be interested to know where these clones came from. ''Bloody Mary'' was found in some India hybrids. The clone, ''American

Beauty'', originally came from Guatemala many years ago. The Lady who gave it to me, that is the original clone, obtained it in Guatemala. However she says Mr. Cammack had it or one very similar to it which he called ''American Beauty'' and that is why she called it by that name. She feels it is the same clone Mr. Cammack had. The third clone is an odd clone I received from Warmenhoven in a shipment of pink and white clones.

All three clones grow vigorously. ''Bloody Mary'' is very white with blood red flushing. It actually looks as if it is bleeding, the red is so brilliant. The tepalsegs are extra wide, often 5 inches across, very round and the flower is a good 8 to 9 inches across. ''American Beauty'' is white and rose, about 7 to 8 inches in diameter and of good form. Both of these are very beautiful flowers. ''Clone 700'' is a well formed flower 7 to 8 inches in diameter but is somewhat of an ugly duckling. It is whitish green spotted and picoteed red to violet red, very dark, not much of a looker but has color pigment, is vigorous and makes nice seedlings. I cross these on self seedlings of these three parents generally and get whites, red and white, rose and white, some with purple tones and picotee types. Most people who have flowered these seedlings marvel at their coloring and beauty.

Another interesting hybrid I have developed is what I call ''Sunsets''. These are crosses of the Dutch Ludwig's Pink clones on seedlings of a cross between an Indian hybrid and 'Daintiness', I believe. These hybrids have many fine pinks, rose pinks, brick rose, orange and salmon colors among them. The original Indian clone was a large rose with white throat that appears to have quite a bit of *A.* x *johnsonii* in it. I feel if one would cross Ludwig's Dutch clones on *A.* x *johnsonii* he would get interesting large flowering hybrids good for cultivation in the south.

Over the years I have saved the best seedlings of ''Gracilis'' that I have flowered. At first I had trouble with this strain growing here but I have about ten clones now that grow very easily. Most have 6 flowers per scape and are orange. Possibly by selecting these still further I can obtain a strain that can easily be raised in a pot. I feel we give too little attention to these fine small amaryllis. They are wonderful pot plants when established. I had some pots last spring with as many as 20 flowers open at a time. They were really beautiful.

I have another cross from Mr. Cooper of Hawaii. It is *A. aulica platypetala* x 'Floriade'. I can not make this cross myself but it is a fine one that produces large late flowers, mostly pen stripes; a very fine hybrid. I feel it should be called ''Cooper's Hybrid''.

THE HARRISON HYBRIDS

Before I quit rambling I would like to say a little something about the ''Harrison hybrids'' which will be available to the public this season. I know many will be asking questions about them. This is an interesting group of hybrids developed by the late Mr. Harrison in his mountain garden in Mexico. They are interesting for a number of reasons and since Mr. Harrison was murdered this adds a strange and interesting side line to this strain. As I said they were developed and raised in the mountains of Mexico where I am sure the temperature is cooler and much more even than here in the south. These bulbs should be best suited to the cooler areas of California and the west where the nights have been too cool for other amaryllis hybrids. Try a few of these if you are in one of these areas. The bulbs of the "Harrison hybrids" vary a lot in size. I am sure Mr. Harrison was growing these for his own pleasure and was not interested in commercial production as I do not feel he let size of bulb influence him in his selection. I feel with the many medium size flowers in this strain he saw beauty where it was and size did not influence him greatly. Most men like large flowers and this is somewhat strange as many Men's idea of beauty in women is not bigness. But then I am talking about amaryllis and this is quite a different thing. The size of the Harrison bulbs vary a lot; so do the size of the flowers. Some are very large; others are what I call medium size. None are as small as the "Gracilis".

I do not think Mr. Harrison had anything particularly in mind but beauty. The color range is quite extensive. If there are any dominating colors it is possibly pink and white and striped varieties. However, there are solid colored ones from lightest pink to dark rose, from light red to near black, some exceptionally beautiful large salmon and orange ones that are very scarce among the Dutch clones. If there was one color he preferred, I would say it was the 'Apple Blossom' types. These show the influence of 'Apple Blossom', I am sure. There are some beautiful pink and whites that vary in color to lavender pink. These in my opinion are very beautiful. There are some huge white penciled red. There are picotee types, some have six or more flowers per scape. They open up quite a possibility for new types and colors in hybridizing; something we need.

As I write this to make the last minute dash before publication I look back to the same situation each year and if I might take the privilege to make a little personal observation, now that I am retired from my regular work, I do hope in the future I will find time to be more timely. I am sure your editor will agree that this is desirable and I would like to thank him for his patience. I feel we all should appreciate the great effort he puts into editing the Amaryllis Year Book.

AMARYLLID CULTURE IN VIRGINIA

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In the State of Virginia we find four general divisions for growing plants, according to the topography. They are namely, Tidewater, where the soils are nearly sea level, Piedmont plain, where the salt water comes up as far as Richmond in the James River and stops at the locks, the mountainous Shenandoah section, and the Southwest, where the land is very productive.

Richmond offers a pleasant climate and is a mecca for plant lovers. Chesterfield county adjoins on one side and here the growing is affected by a variety of soils and weather as it is influenced by the Appomattox and the James rivers. A County Agricultural Agent in extension work showed slides at my garden club. Among them was *Crinum americanum* grown in a large clump in his yard. This was in full bloom with many umbels fully headed out at once. This clump has been there for six years; having been transferred from a bog in Alabama.

On the opposite side of Richmond is Hanover and Henrico County. This section produces lush bulb growth and good farm products for the table. According to the County Agent, there is a favorable current of air over this section which persists. The vegetables, fruits and flowers from this section have great vigor, substance and color and are ready for the early market.

As the hardy amaryllids resent being moved and cultivated, it is necessary to start by planting in good friable soil, using a quantity of old well rotted manure and leaf mold, at planting time. A goodly amount of this placed under the bulbs when planted pays off in later years. A while back we had a long rainy spell when moisture fell each day for six weeks. This resulted in die-back of some bulbs. When lifted the entire clumps had turned black as coal. We were informed by the State Dept. of Agriculture that this was the result of salt being picked up into the air and deposited later through the rains.

Plantings of *Sternbergia* and *Zephyranthes* have been successful only when in a sheltered position. *Zephyranthes atamasco* and *candida* flourish well and are the most rugged. The evergreen foliage is always pretty; these generally decorate our table for Thanksgiving.

Lycoris radiata is perfectly adjusted to this section. They multiply and thrive no matter where they are placed as long as they receive water during the flowering period. They seed easily too. *Lycoris squamageria* also grows well. *Lycoris* seeds should be thick, glossy and black and should go into the ground when in this condition. *Lycoris* should be planted a little further apart than other bulbs to keep the blooms from tangling in the wind. These bulbs should be planted up to their neck in the earth. Do not plant too deep as they will grow upwards, somewhat like a tulip droplet. This causes them to skip a blooming season or two while they rebuild the plant structure. All amaryllids resent winds which mar the large strap-like leaves and cause the flowers to fade. Many enjoy partial shade, especially Crinums. It keeps their color clear and the blooms crisper.

Many uses of mulching with leaf mold have been found. It keeps the tips of the leaves from browning, the bloom shaft is protected and soil moisture is conserved. If some of your plantings do not multiply and bloom properly, try placing some large stones or bricks about the plants. Stones are best. This helps the plant to keep the heat near the bulb longer; thus these semi-tropical bulbs feel at home again and divide normally.

During World War II, a naval officer was given his orders to return to the States. It was necessary for him to walk several miles and carry his gear on his back in order to make his check-out station. This was Leyte, hot and humid. The officer was nearly exhausted when all at once he spotted a large group of *Lycoris squamageria,* waving in the wind in full bloom. It seemed to him to be a signal to push on as he had seen them in my yard here at home for he was my son. These are more temperamental and bloom less often than *L. radiata,* which always bloom. *Lycoris aurea,* the Golden Lycoris only responds to container-culture here. It is well worth the extra attention for it has such exquisite detail of form. *L. sprengeri* or Blue-tipped Lycoris has blunt, green foliage. It does bloom freely but appears to do best when grown in a container.

Powell's white and pink Crinums (*Crinum* x *powellii album* and *roseum*) bloom every year and are disease free it seems. They are grown in full sun, and only need extra moisture during the blooming period. The Milk-and-Wine clone I have is rather fluted and needs some protection from full sun or it does not last. These are larger flowers, more showy, but rather delicate. These bulbs multiply fast and do not mind being separated or moved. The foliage is rather a grayish green; broad and strap-like. I shall try some other species this season and let you know how they do here.

I grew one of the Chalice Lilies, *Hymenocallis narcissiflora* which is native to Peru. These bear large white, fragrant blossoms. They freeze easily and must be dug one week after the first frost. Allow the full seven days for the foods in the stalk and leaves to move back into the bulb. The roots are never removed. If you plant before June 1st., in Virginia, the plant will go to stalk and leaves, feed and multiply but will not bloom. By waiting for the ground to warm up you gain, as it will often grow very rapidly and bloom in fourteen days. Thus you can plan for a show or display and be assured of blooms. If you wish a longer blooming period, stagger the plantings two weeks apart.

I will try to grow some of the beautiful native American Chalice Lilies. These are found from North Carolina to Florida, and on to Texas. *Hymenocallis palusvirens* is found in North Carolina, and many others are found further south. *Hymenocallis caroliniana* ranges from the Carolinas and Georgia to Missouri, Oklahoma and east Texas; it is one the finest.

PLANT LIFE LIBRARY—continued from page 96.

WEATHERED WOOD WITH FLOWERS, by Mary G. Knight. William Morrow & Co., 425 Park Ave. So., New York, N. Y. 10016. 1968. Pp. 127. Illus. Mrs. Knight has found inspiration in designing floral arrangements featuring wood as she has found it in nature. She points out that all materials suited to various flower designs are appropriate with weathered wood. Highly recommended to all who are interested in flower arranging.

TRIPLE RIDGE FARM, by Ruth Fauts Pochmann. William Morrow & Co., 425 Park Ave. So., New York, N. Y. 10016. 1968. Pp. 233. Illus. $5.95. This is a "glowing account of a family's devotion to their Wisconsin farm and how they restored its natural wonders and beauty." This is a worth while inspirational book and is highly recommended to all who are interested in the restoration of the American heritage, and conservation.

FLOWERS AND FURNITURE IN AMERICAS HISTORIC HOMES, annotated by Elfreda Finch. Hearthside Press, 381 Park Ave. So., New York, N. Y. 10016. 1967. Pp. 120. Illus. $10.00. This beautiful book is concerned with the **historic houses all over the United States,** and the flowers which complement the furnishings within. Each of the 45 houses illustrated is accompanied by a few succinct paragraphs giving its history. This utterly delightful and profusely illustrated book is indispensible to all interested in home furnishing and flower arrangements.

FLOWERS AND SYMBOLS FOR THE CHRISTIAN YEAR, by Ruth E. Mullins. Hearthside Press, 381 Park Ave. So., New York, N. Y. 10016. 1967. Pp. 160. Illus. $6.95. This is the outstanding book on flower arrangements for the Christian Year. The topics discussed include new trends, new needs; Christian symbolism; flower arrangements for major events, and special Christian occasions; secular days observed in Church and home; and the Church, the club and you. Highly recommended to all flower arrangers.

ROSE CALENDAR 1969, by Hearthside Press, 381 Park Ave., So., New York, N. Y. 10016. 1968. Illus. $1.75. This Rose Calendar for 1969, sponsored by Helen Page, of Hearthside Press, is suitable for use in a popular fund raising project for club groups. For the twelve months appropriate illustrations, mostly formal flower arrangements featuring roses are included. Clubs interested should write directly to Helen Page, c/o Hearthside Press.

INDOOR GARDENS, by Ware Budlong. Hathorn Books, 70 5th Ave., New York, N. Y. 10011. 1968. Pp. 175. Illus. $6.95. Subtitled "A Collection of Novel Ideas for House Plant Grouping" serves as an inspiration to the gardener as well as a practical guide about the details of indoor gardening. The topics discussed include starting the indoor garden; garden decor; waterfall, larger, nostalgia, movable, herb, rock, gesneriad, and children's gardens; terrariums; no-sun gardens; personalized gardens; garden projects; and doors to more gardens. Highly recommended to all gardeners.

FRUITS FOR THE HOME GARDEN, by Ken & Pat Kraft. William Morrow & Co., 425 Park Ave. So., New York, N. Y. 10016. 1968. Pp. 287. Illus. $6.95. The first part of this book introduces the subject of dwarf fruit trees, including culture, pest control, pruning and espaliers. The second part presents a treasury of fruits, including tree fruits, berry fruits and grapes. The third part is concerned with the experimenters garden, the suburban fruit garden, sharing fruits, fruits and health, and the future of fruits. Recommended to all home gardeners.

HOW TO PRUNE ALMOST EVERYTHING, by J. P. Baumgardt. William Morrow & Co., 425 Park Ave. So., New York, N. Y. 10016. 1968. Pp. 192. Illus. $5.95. This is a guide to pruning practices, including specific directions for more than 300 different plants grown in the United States. The topics discussed include why we prune, how to prune, when and where to prune, special techniques for special purposes, and encyclopedia of plants, from **Abelia** to **Zizyphus,** with pruning instructions; Do's and Don'ts, and a seasonal guide. Recommended to all gardeners.

A MERRY CHRISTMAS HERBAL, by Adelma G. Simmons. William Morrow & Co., 425 Park Ave. So., New York, N. Y. 10016. 1968. Pp. 160. Illus. $5.95. This is a book of lore and legend, decorations and recipes for all who are under the spell of Christmas. The topics discussed include Christmas at Caprilands; Christmas trees; wreaths from the herb garden; Heartha and Huldah; fire and flax; St. Barbara's Day; St. Nicholas' Day; St. Lucy's Day; Christmas Reveillon; New Year's Day; Epiphany; growing the Christmas garden, and herbal gifts from the kitchen and garden.

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ADAPTING NATIVE PLANTS TO GARDEN CONDITIONS

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Woodland Hills, Calif. 91364

For many years in Michigan I had practiced ways of moving plants directly from their native "wild" locations to locations within the around-the-house flower borders. Such new homes were carefully and thoroughly selected and prepared to simulate as closely as feasible the conditions to which the plants were accustomed. There was enough success achieved to warrant the continuance of this tedious and exacting procedure.

Now that I am in California, I have gone at the problem in a totally different way. I now sow seeds and select from the seedlings those plants which indicate a tendency to adapt to the totally different environment, using these selected plants as seed parents for succeeding generations. To date I have had encouraging success with two interesting plants. Seed of both were secured from the Santa Barbara Botanic Garden, Mission Canyon, Santa Barbara, California. My fundamental purpose was to develop additional sources of bright blue color, much needed in California gardens.

Pentstemon azurea. Seed were soaked for six days in a colchicine solution, then sowed in an outdoors bed under a lath and polyethylene film shade. This was done in September; by April of the following year there were seedlings large enough to be spaced out and to be transplanted to varying locations to try to determine if the plant has a noticeable preference for certain exposures and moisture levels. In June of that same year (nine months from sowing) the first flowers showed. From these flowering plants, seed were taken from the one plant which had the most desirable combination of bright blue flowers with a minimum of purple at the base of the tubes, stems which were erect and strong, and a general neatness of clump growth. In late September these seeds were in turn soaked in a colchicine solution for six days, then sowed in similar conditions. From these, one plant with a deep, bright blue flower coloration, which also flowered early, was selected to be a seed parent.

At the present time I have accumulated approximately twenty parent plants, being evaluated further for their ability to withstand the usual garden conditions, which include periods of total neglect. Attrition has been high, and I have not hesitated to rogue out any plants which went loppy or off-color. Two of the plants are low, compact, spreading to twelve-inch diameter neat clumps which flower the entire set of stems at one time. Another, which flowered in early March, flowered again in mid July; its flower stalks had been cut in April, to prevent seed formation.

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Even without further development, I feel that I have a stock of parent plants from which, by asexual reproduction, I can provide considerable quantities of the bright blue color that was needed.

Pentstemon spectabilis. This plant was chosen as a possible source of tall spikes of blue. The same methods were used as with *P. azurea,* as described above, but success was limited. Only one plant remains, the balance having been too rank in growth, with resultant loppiness. Further, only one plant showed what could be classed as ''blue'', most being a weak lavender or magenta.

Sisyrinchium bellum (Blue-Eyed Grass). After a six-day soak in a colchicine solution, seed were sown in a deeply shaded location outdoors in September. Germination was excellent, and spacing the seedlings was accomplished with very little loss. From June of the next year, to the following June, flowering occurred regularly. Most were small, plain purplish-blue, with scraggly or rank and loppy growth. These were rogued out. One plant of the hundreds grown was saved as a seed parent: it was upright, formed a neat clump, had larger flatter flowers of bright blue. Its first year it flowered from mid-March to early June.

The second year, the parent plant was divided into two smaller clumps, which were planted so that one had morning exposure and one had afternoon exposure. The latter flowered heavier and set more seed. However, with the coming of full summer both plants faltered and dried out by mid-July, indicating that the plant is not yet ready for exposure to so much sunlight and dryness. Seeds taken from these two clumps will be sown in the shade for a repeat of the process.

Iris douglasiana. Per instructions for growing this type of plant, seeds were layered in sphagnum moss in the refrigerator until there were signs of growth. The seeds were sown in different locations, in different soils and with different moisture levels. Of all the many seeds, only one plant survived germination and transplanting operations. This one is tucked into a corner where it sees only morning sunlight, but it just doesn't want to prosper. I intend to try again, with this plant as well as the taller *I. longipetala.*

PRUNUS PERSICA FORMA **ZEYLANICA, FORMA NOV.**

Prunus persica Batch, forma *zeylanica* Traub, *forma nov.* (Rosaceae), forma tropica, a forma typica speciei enim florens frigus hiemis non imperens; fructo putamente libero, carne cremeo differt. Holonomenifer (typus): No. 1086 (TRA), Jan. 25, 1968, cult. La Jolla, Calif.

A tropical form not requiring a winter cold period for flowering, fruit up to 3.8 x 4.2 cm. in size; free-stone, flesh greenish to cream-colored.—*Hamilton P. Traub*

ELECTRIC DRYING PRESS FOR HERBARIUM SPECIMENS

PHILLIP VAN DER MERWE[1] AND P. J. GROBLER[2]

Government Herbarium, Stellenbosch

In the past various methods were used to speed up the drying time for herbarium specimens. Amongst others, ventilated electrical ovens were used, but without much success as the centre of the press is not adequately heated, with a resulting condensation of moisture, which retarded the drying process.

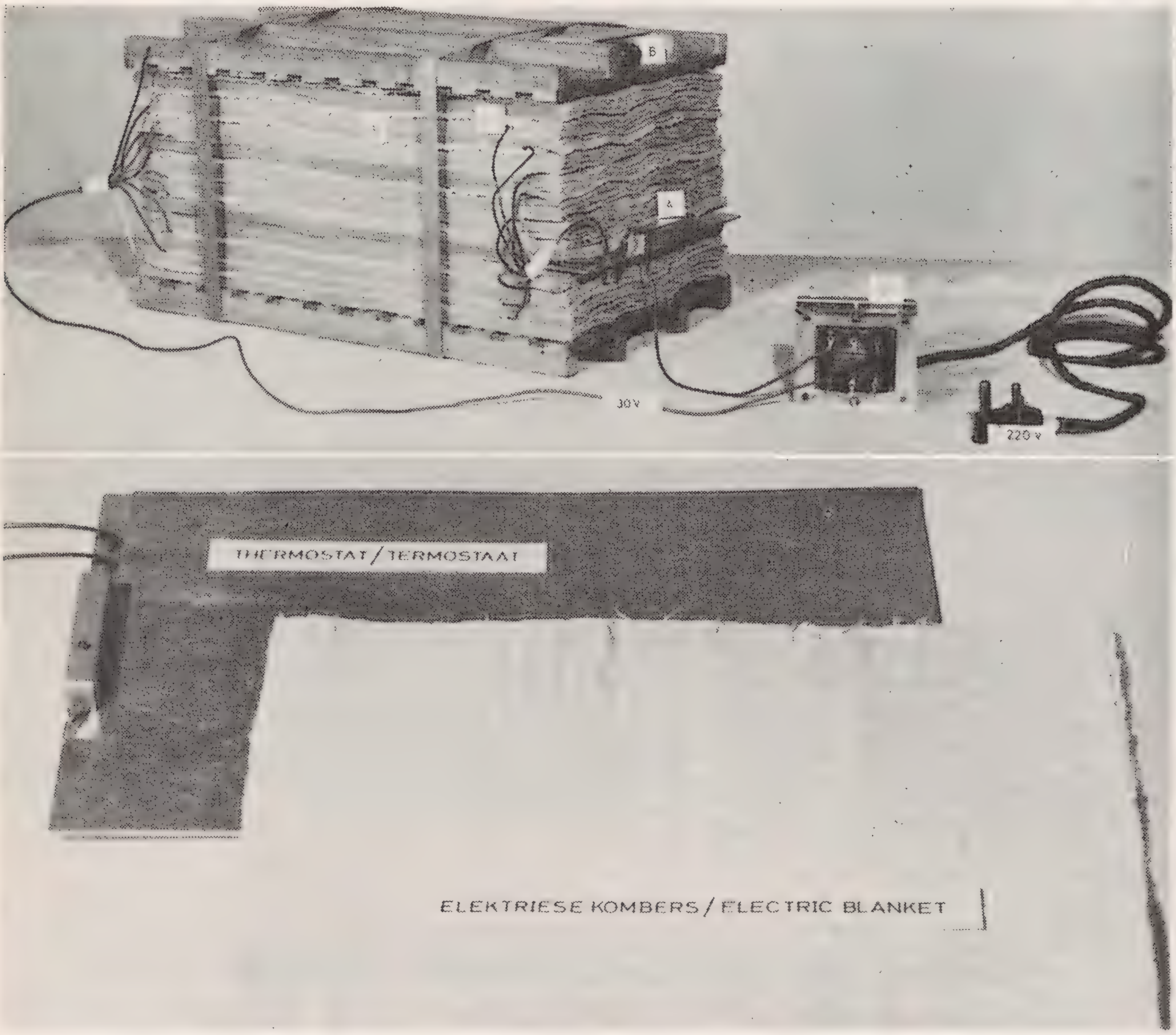

Fig. 25. **Upper,** Electric drying press for drying herbarium specimens: **A,** thermostat, **B,** indicator light, **C,** electric blanket, **D,** transformer (primary 220 V/ secondary 30 V) and **E,** drying paper. **Lower,** electric blanket and thermostat.

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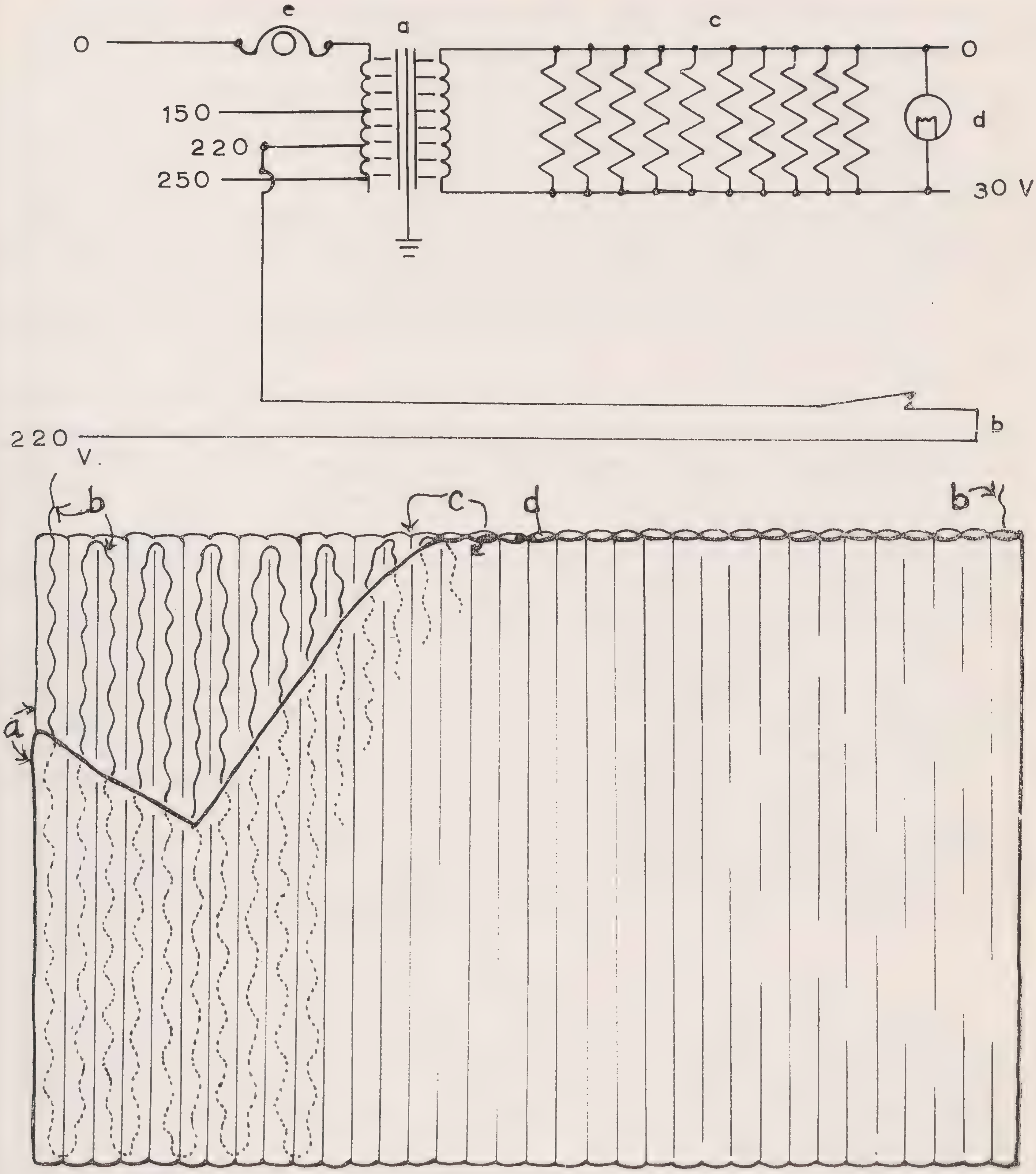

Fig. 26. Electric drying press for herbarium specimens: **Upper,** diagram of wiring of electric press: **a,** transformer; **b,** thermostat; **c,** 220 V/600 W resistance (10); **d,** indicator light; and **e,** fuse.

Lower, electrically heated blanket: **a,** two canvas squares stitched together; **b,** element wire; **c,** stitching; and **d,** parallel openings.

THE CONSTRUCTION OF THE ELECTRICAL PRESS (See Figs. 25 & 26):

The electrical plant press is basically a conventional press with electrically heated blankets (25 x 40 cm.) evenly spaced amongst the normal drying paper.

A thermostat is included in the circuit to regulate the working temperature.

Because open resistance wire is used in close proximity to moist plant material, a transformer is used to bring the 220v current down to 30v—to eliminate any shocks.

A fuse is incorporated to prevent overloading of the transformer. A red indicator light shows the "on" and "off" positions of the apparatus.

Not to curb ventilation in the press, the heating blankets are made of canvas. Each "blanket" is made up of two 25 x 40 cm. canvas squares stitched together in such a way that parallel openings 1 cm. wide are left through which the resistance wire is threaded.

For each blanket, one spiral 600w/220v element wire is used. The spiral is stretched so that a little kink is left in the wire before it is threaded. The kink keeps the canvas apart to facilitate ventilation. Each end of the element is connected to a 30 cm. piece of insulated wire.

Ten electrical blankets (the number depends on the current the transformer can supply) are connected in parallel and connected to the transformer (30v). The primary coil of the transformer is connected to the 220v mains.

An adjustable thermostat, mounted on a stainless-steel sheet of 25 x 43 cm., is connected to the circuit.

The electrical blankets are evenly spaced between the drying sheets of a conventional drying press. The steel sheet with thermostat is placed between sheets 5 and 6, the hottest part, and is set to cut out at 60°C.

EXPERIMENTS WITH THE ELECTRICAL DRYING PRESS:

With the electrical drying press, plants can be dried using one of two methods by either placing the plants in a cold press or into the press already at its working temperature. The last method is important in cases where the leaves tend to drop, as with Erica spp., to kill the plants as soon as possible.

An experiment was conducted to establish the drying speed of the press; on 14th January, 1967, 17 plant species were collected in duplicate and on 15th January, 1967 at 9:00 a.m. one set was placed in a cold electrical press. As a control a duplicate set was placed in an ordinary plant press at 8:00 a.m. on 15th January, 1967.

RESULTS:

The specimens in the above experiment took 23 hours to dry in the electrical press and 116 hours in the conventional plant press.

In the case of the electrical plant press, the laying out and placing the plants in the press and taking them out took 20 minutes and no change of paper was necessary. The laying out and taking out in the conventional press also took 20 minutes, but an additional 60 minutes was spent in the changing of the wet paper during the drying process.

These specimens were then judged taking into consideration colour, appearance and probable/possible fungal damage. One, two or three points were awarded, depending on the quality of the specimen. The judging was done by three persons independent of each other and in such a way that they were not biased. The specimens dried in the conventional press were awarded 29, 25 and 27 (mean 27) points by the three judges and the specimens dried in the electrical press were awarded 29, 36 and 35 (mean 33) points.

CONCLUSIONS:

According to the judging of the 17 specimens, the electrical press produces as good and even better specimens than the conventional press (mean 33 against mean 27) points.

The higher points were awarded mostly because the better specimens were produced by the fast drying coupled with the heat. Colour reaction was confined to certain spp. with some reacting better to the conventional and others to the electrical drying press.

The considerable saving of time is the greatest advantage of the electrical drying press. The 17 spp. were dried 93 hours sooner than those in the conventional press and required 60 minutes less handling time (drying paper in the electrical press is not changed).

It is expected that more specimens and damp weather conditions would have increased the difference in drying time considerably. With the saving in handling time, more specimens of a better quality can be produced at a great saving in cost per unit.

SUMMARY:

By using electrically heated blankets in a conventional plant press, herbarium specimens of a better quality can be reproduced with less handling and a great saving in time. The necessity to change drying sheets in the press is entirely eliminated and no fungal damage occurs.

APPRECIATION:

1. Prof. P. G. Jordaan, Department of Botany, University of Stellenbosch, Republic of South Africa, is thanked for his encouragement and supplying material and services. 2. Prof. J. T. R. Sim, Department of Pasture/Agronomy, University of Stellenbosch, is thanked for giving consent to build the first electrical press for Departmental use. This made the final improvements possible. 3. The Secretary, Department of Agricultural Technical Services, is thanked for the cash bonus awarded to both authors for developing a time saving apparatus.

PLANT LIFE LIBRARY—continued from page 128.

MACROMOLECULES OF LIVING SYSTEMS—STRUCTURE AND CHEMISTRY, by Herbert S. Rhinesmith and Luigi A. Cioffi. Reinhold Book Corp., 430 Park Ave., New York, N. Y. 10022. 1968. Pp. xi + 164. Illus. $4.75. The purpose of this book is to present a "macromolecular anatomy" which might be preliminary to a "macromolecular physiology." The topics discussed include the origin of living matter; structural units; carbon compounds; three-dimensional structures; atomic structure; lipids; carbohydrates; amino acids; proteins; nucleic acids, and the genetic code. This highly stimulating book is highly recommended to all interested in the coming into being of organisms, physiology and biochemistry.

'TORREY CANYON' POLLUTION AND MARINE LIFE, edited by J. E. Smith. Cambridge University Press, 32 E. 57th St., New York, N. Y. 10022. 1968. Pp. ix + 196. Illus. $9.50. The whole world was shocked to read about the cargo of 117,000 tons of crude oil which leaked into the sea from the "Torrey Canyon" for ten days in March of 1967. Enormous quantities of detergents were applied in the effort to disperse the oil. This in turn had a deleterious effect in poisoning marine life. The latter effect is the subject of this report of the Plymouth Laboratory of the Marine Biological Assoc. of Britain. The ten-week project is described in detail, including results from field observations and laboratory experiments. Its great value lies in the outline of methods for predicting and plotting the movement of oil at sea. Highly recommended to all interested in conservation, including ecologists and marine biologists.

INTRODUCTORY PLANT SCIENCE, by Henry T. Northen. 3rd edition. Ronald Press, 79 Madison Ave., New York, N. Y. 10016. 1968. Pp. viii + 586. Illus. This third edition of an excellent text on introductory plant science will be welcomed. Its purpose is to present to the beginning student a clear view of the plant world. The topics discussed include plants in human affairs; plant physiology; anatomy; genetics; plant communities; conservation; variation and bioevolution; groups of plants. This outstanding profusely illustrated, easy to read text is highly recommended to all beginning students and amateur plantsmen who wish to take a refresher course in introductory plant science.

PHOTOSYNTHESIS, by G. E. Fogg. American Elsevier Publ. Co., 52 Vanderbilt Ave., New York, N. Y. 10017. 1968. Pp. xii + 116. Illus. $3.95. This balanced, easy to read review of recent discoveries about the mechanism of photosynthesis, and of the wide implications of the subject, will be welcomed by the beginning student. The topics discussed include the nature of photosynthesis; role of chlorophyll, etc.; the supply of light; carbon dioxide and water; the absorption of light; the conversion of light energy; the path of carbon assimilation; the flexibility of photosynthesis and its interrelations with other processes; and photosynthesis and life, past, present and future. This stimulating book is highly recommended to all beginning students.

TAXONOMY OF AMERICAN SPECIES OF LINDEN (TILIA), by G. N. Jones. University of Illinois Press, Urbana, Ill. 1968. Pp. 156. Illus. $5.95. This is a taxonomic monograph on the four American species of Linden (**Tilia**). It includes discussions of the taxonomic position of **Tilia**, generic diagnosis, morphology, chromosomes, hybrids, properties and uses, propagation, geographical distribution, etc. This is followed by the analytical keys to, and detailed descriptions of, the species, including citation of numerous specimens, excellent illustrations, and an adequate index. Recommended to all interested in the American Flora.

CRITICAL REVIEW OF THE GENUS **GALANTHUS** L.

Z. T. Artyushenko,

Komarov Botanical Institute, Leningrad

In a recently published article (Artyushenko, 1966) an attempt was made to appraise the related connections of the representatives of the genus *Galanthus* growing mainly in the Caucasus. The areas of some of the native snowdrops lie outside the Soviet Union. This fact as well as the desire to represent the taxonomy as a whole has compelled us to investigate in greater detail all foreign materials available to us.

To attain these objectives, we tried to make our collection of live specimens of foreign snowdrops as complete as possible, cultivating them along with the snowdrops of our flora. This enabled us to study them under conditions comparable between themselves.

Great assistance in creating such a collection was rendered to me by Elliot Hodgkin, Patrick Synge, Brian Mathew, Frederick Stern and others from England, K. A. Zahariadi from Roumania and D. D. Delipavlov from Bulgaria. I take the opportunity to express my cordial gratitude to all of them for the dispatched plants.

I. PREVIOUS WORK

The first scientist to divide the genus Galanthus into taxonomic groups was Günter Beck von Mannagetta, 1894. In his treatment the genus Galanthus is represented as follows:

I. Rank **NIVALES**

Leaves with prominent rib below, with flat margin:

1. **Galanthus nivalis** L.

This species comprises the following varieties:

Var. 1. **europaeus** G. Beck.

Twenty forms belong to this variety and they differ from each other by the following characters:

(a) by the shape of outer tepals —(1) **stenotepalus** G. Beck, (2) **platytepalus** G. Beck;

(b) by the shape and number of inner tepals—(3) **poculiformis** Hort., (4) **hololeucus** Celak., (5) **hortensis** Herb., (6) **plenissimus** G. Beck;

(c) by the colour of tepals—(7) **albus** Allen, (8) **sandersii** Harpur Grew, (9) **pallidus** Smith, (10) **viridans** G. Beck, (11) **virescens** Leichtl.;

(d) by the flowering period—(12) **aestivalis** Burbidge, (13) **olgae** Orph., (14) **corcyrensis** Hort.;

(e) by the shape of spathe—(15) **candidus** G. Beck, (16) **scharloki** Casp., (17) **cathcartiae** Allen;

(f) other deviations—(18) **biscapus** G. Beck, (19) **biflorus** G. Beck, (20) **trifolus** G. Beck.

Var. 2. **major** Ten.
Var. 3. **caucasicus** Baker.
Var. 4. **redoutei** Rupr.

2. **Galanthus graecus** Orph.

3. **Galanthus elwesii** Hook.

This species comprises the following forms—(1) **typicus,** (2) **maximus** Velen., (3) **reflexus** Herb.

4. **Galanthus latifolius** Rupr.

This species comprises the following forms—(1) **typicus,** (2) **alleni** Baker, (3) **fosteri** Baker.

II. Rank **PLICATI**

Rib not so prominent; leaves plicate on margin.

5. **Galanthus plicatus** M. B.

This species comprises the following varieties:

Var. 1. **genuinus.** This variety comprises the following forms: 1) **typicus,** 2) **excelsior** G. Beck, 3) **maximus** Allen.
Var. 2. **byzantinus** Baker.

6. x **Galanthus valentinei** G. Beck

7. x **Galanthus hybridus** Allen

Among numerous garden forms enumerated by Beck, there are such, which at present are considered as independent species (**G. reginae-olgae, G. corcyrensis, G. fosteri**).

One also cannot agree with the author in considering **G. Caucasicus** as a variety of **G. nivalis,** and in treating **G. byzantinus** as a variety of **G. plicatus.** They are quite independent species.

In 1947 L. M. Kemularia-Natadze published a summary of the taxonomy of Caucasian snowdrops. According to that author, the classification of the genus is as follows:

Sect. I. **Viridifolii** Kem.-Nath.

Leaves not glaucous but green.

Ser. **Woronowii** Kem.-Nath.

Leaves shiny, green, channelled, folded inside with hood on the top: 1. **G. woronowii** Losinsk.; 2. **G. caspius** (Rupr.) Grossh.; 3. **G. valentinae** Panjut.;

Ser. **Latifoliae** Kem.-Nath.

Leaves broad lanceolate, with small hood on the top. No anther apiculus: 4. **G. latifolius** Rupr.

Ser. **Fosteriae** Kem.-Nath.

(not available in the Caucasus)

Ser. **Angustifoliae** Kem.-Nath.

Leaves flat, narrow, matt-surfaced, not glaucous, without hood on the top: 5. **G. lagodechianus** Kem.-Nath.; 6. **G. ketzkhovelii** Kem.-Nath.;

Sect. II. **Glaucaefolii** Kem.-Nath.

Plants glaucous; mark heart-shaped or horseshoe-shaped.

Ser. **Nivales** Kem.-Nath.

Leaves flat, top thickened but without hood: 7. **G. alpinus** Sosn.; 8. **G. caucasicus** (Baker) Grossh.

Ser. **Elwesiae** Kem.-Nath.

(not available in the Caucasus)

Ser. **Plicatae** Kem.-Nath.

(not available in the Caucasus)

Ser. **Schaoricae** Kem.-Nath.

Leaves convolute in vernation, channelled, top with hood: 9. **G. schaoricus** Kem.-Nath.

With such minute division of the genus into sections, any further subdivision into series is not justified. Thus, for example, **G. caspius**, a species close to **G. lagodechianus**, as mentioned by the authors in their study of genetical relations of this latter species, was erroneously included into the series **Woronowii**, whereas the species **G. latifolius** close to the series **Woronowii** is considered as an independent series.

The section **Glaucaefolii**, in addition to the feature of glaucous leaves, is characterized by the presence of a definite shape of a mark which has not been mentioned in the examination of the foregoing section. However, this character varies greatly and the mark of such a shape inherent in the snowdrops of this section can also be found in other species. A photograph (Fig. 27) given as an example illustrates the variability of the mark shape in individuals of **G. caucasicus** gathered from 1 sq.m. in Tbilisi region (Kodzhori) as well as in **G. platyphyllus** collected from 1 sq.m. in Krestovy pass.

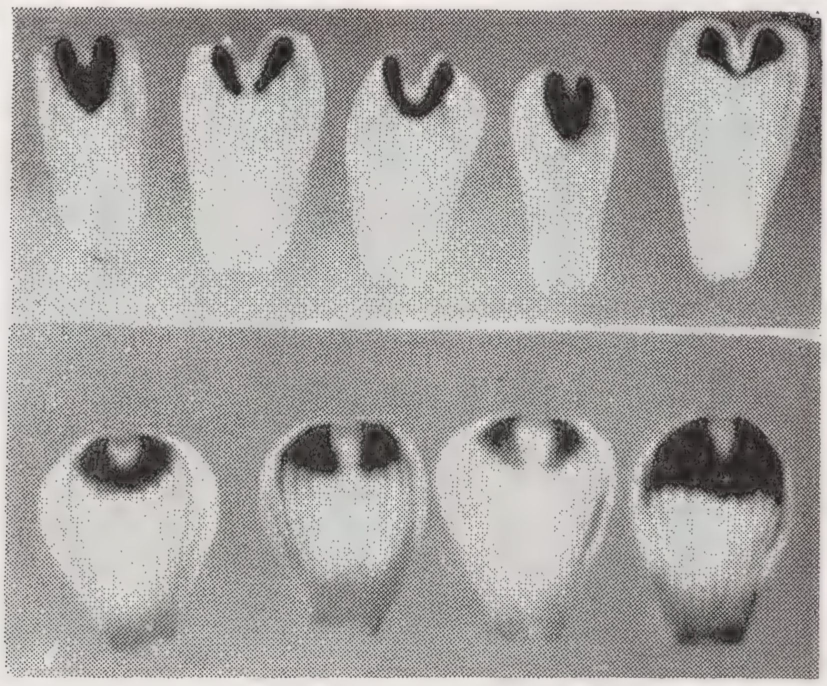

Fig. 27. Variability of markings on tepals of two **Galanthus** species: **upper, Galanthus caucasicus; lower, Galanthus platyphyllus.**

It should also be noted that snowdrops classified by the author under the series Nivales are in no way characterized by flat leaves neither in vernation nor in mature state. Their outer leaf embraces the inner one and at least the wider outer leaf in vernation is rather channelled. Species with genuinely flat leaves in vernation and in mature state **G. caspius**, **G. lagodechianus** and **G. ketzkhovelii**—are classed by Kemularia-Natadze with a different section.

In 1948, Traub & Moldenke published "The Tribe Galantheae", including lineagic treatises of the genera **Galanthus** and **Leucojum.** They divided the genus **Galanthus** into two subgenera: **Eugalanthus** Traub et Mold. and **Plicatanthus** Traub et Mold.

The character of the leaves was chosen as the principal feature for distinguishing the subgenera. The species of the subgenus **Eugalanthus** are characterized by flat leaves in vernation, with prominent midrib on the lower surface. The following species belong to this subgenus:

1. **G. nivalis** L.; 2. **G. gracilis** Celak; 3. **G. olgae** Orph.; 4. **G. elwesii** Hook; 5. **G. graeous** Orph.; 6. **G. caucasicus** (Baker) Grossh.; 7. **G. maximus** Velen.; 8. **G. perryi** Baker; 9. **G. alleni** Baker; 10. **G. transcaucasicus** Fomin; 11. **G. platyphyllus** Traub et Mold.; 12. **G. fosteri** Baker; 13. **G. cilicicus** Baker; 14. **G. ikariae** Baker.

Species characterized by leaves plicate along the margins belong to the subgenus Plicatanthus. They are as follows: 15. **G. alpinus** Sosn.; 16. **G. plicatus** M.B.; 17. **G. grandiflorus** Baker; 18. **G. woronowii** Losinsk; 19. **G. byzantinus** Baker.

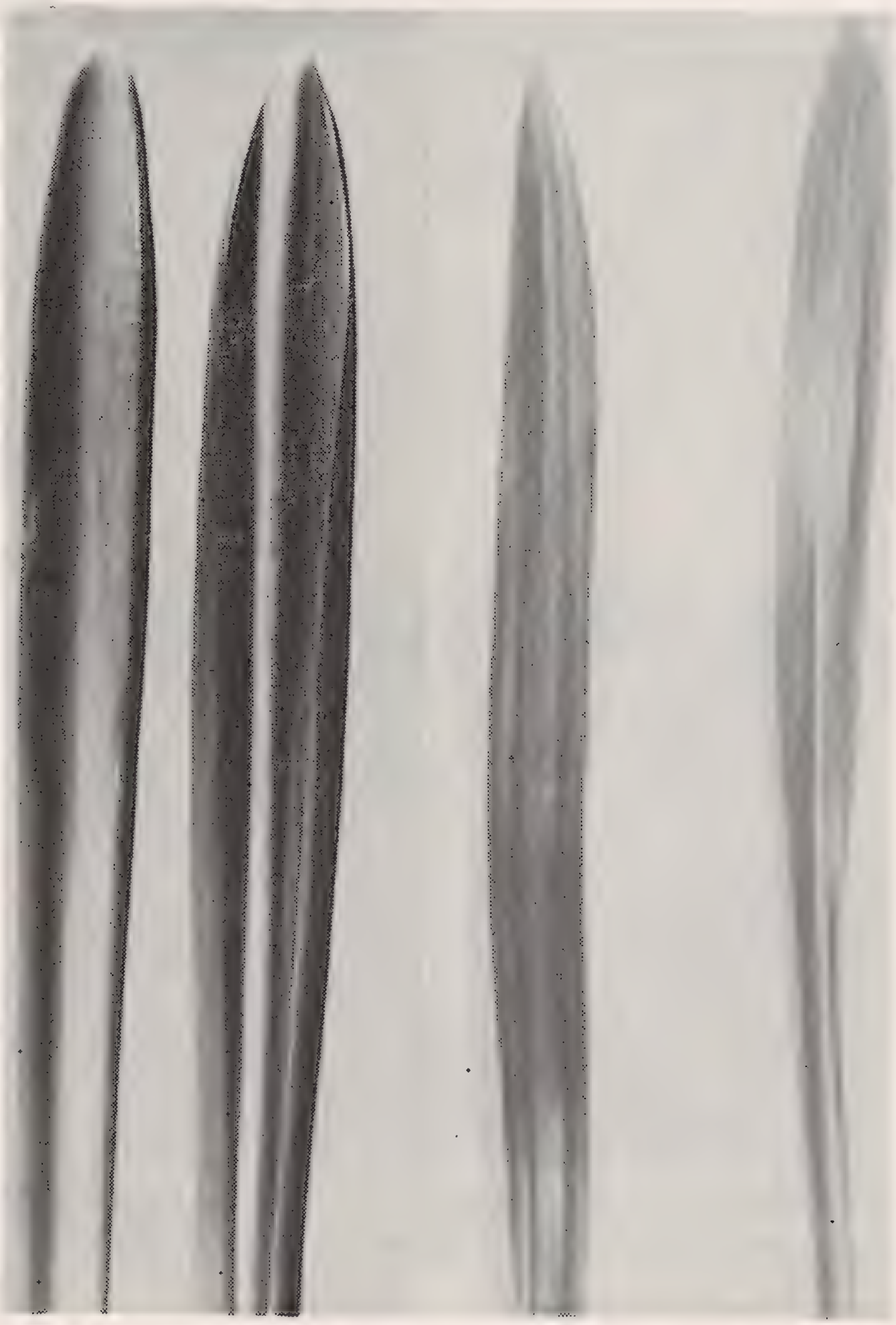

Fig. 28. Folding of leaves in **Galanthus** species: **left, Galanthus plicatus; right, Galanthus ikariae (G. woronowii).**

One cannot agree with the authors in integrating the above-mentioned species into the subgenus **Plicatanthus.** The folding of leaves is inherent in many platyphyllous snowdrops but its origin is dissimilar. Thus, in **G. plicatus** and **G. byzantinus** folding emerges as a result of the turning of the margins toward the lower side and this feature is typical of the two species. As to the folding of leaves in such snowdrops as **G. ikariae (G. woronowii), G. bortkewitschianus, G. alpinus,** it is caused by bending of leaf margins to the upper side, and this feature is generally not constant since it occurs not in all plants (Fig. 28).

The species **G. perreyi** and **G. grandiflorus** are now regarded as cultivated forms.

In 1956 a profusely illustrated monograph by F. C. Stern devoted to the genera **Galanthus** and **Leucojum** was published.

The classification of the genus **Galanthus** according to F. C. Stern is as follows:

Ser. 1. **Nivales** G. Beck

1. **G. nivalis** subsp. **nivalis**; 2. **G. nivalis** subsp. **cilicicus** (Baker) Gottlieb-Tannenhain; 3. **G. nivalis** subsp. **reginae-olgae** (Orph.) Gottlieb-Tannenhain; 4. **G. corcyrensis** (Beck) Stern; 5. **G. rizehensis** Stern; 6. **G. graecus** Orph.

Ser. 2. **Plicati** G. Beck

7. **G. plicatus** M. B.; 8. **G. woronowii** Losinsk; 9. **G. byzantinus** Baker.

Ser. 3. **Latifolii** Stern

10. **G. ikariae** subsp. **ikariae**; 11. **G. ikariae** subsp. **latifolius** Stern; 12. **G. fosteri** Baker; 13. **G. caucasicus** (Baker) Grossh.; 14. **G. elwesii** Hook; 14a. **G. elwesii var. maximus** (Velen.) G. Beck; 15. **G. alleni** Baker.

The investigation by L. M. Kemularia-Natadze and a number of other materials concerning the snowdrops of the flora of the USSR were unknown to F. C. Stern as has already been mentioned in the critical review of his work (Artyushenko, 1958). As a result, a number of Caucasian species remained outside the knowledge of F. C. Stern, whereas several species were improperly included in the key (for example: **G. woronowii** is really typical of vernation inherent in species belonging to the series **Latifolii** and not **Plicati**).

Owing to the lack of herbarium specimens and living plants, F. C. Stern had no opportunity to familiarize himself fully with the species, **G. woronowii** and **G. latifolius** all the more that the drawing of **G. latifolius** in "Gartenflora" illustrating this species has been carried out inaccurately—the inner tepals are shown with a sinus at the top and this is not inherent in this species. A number of species described by Y. I. Koss (1951) and Kemularia-Natadze (1947) after the publication of the "Flora of the USSR" comprising the description of snowdrops (Lozina-Lozinskaya, 1935) were unknown to F. C. Stern.

In 1966, Khokhryakov published his taxonomy of the genus **Galanthus** divided into two subgenera on the basis of the following characters:

Subgenus **Grinoides** Khokhr. Bulbus perennis, scapus fistulosus, perigonii phylla interna integra.

Subgenus **Galanthus.** Bulbus biennis, scapus solidus, perigonii phylla interna excisa.

The first two characters cannot be taken as a basis for the detailed classification of the genus from the following considerations:

Species classed by Khokhryakov with the first subgenus—**G. Krasnovii, G. Latifolius** (= **G. platyphyllus**) and **G. valentinae** (= **G. krasnovii**) have biennial and not perennial bulbs, i.e. are made up of scales of two last years and of unformed scales of the leaf-bud. The structure of the biennial bulb is given in the "Atlas of descriptive morphyology of higher plants" (Fedorov, Kirpichnikov and Artyushenko, 1962) and illustrated by a drawing.

However, Khokhryakov ignored these data. Such species as **G. caucasicus, G. alpinus, G. lagodechianus** etc. also have biennial bulbs but they are classed by Khokhryakov with an other subgenus which comprises bulbs of an annual cycle—**G. nivalis, G. plicatus, G. graecus, G. elwesii,** etc.

As to the number of scales of the annual cycles, the following can be said. If the number of scales in the annual cycle is more or less definite for the given species, the number of annual cycles may vary, depending on the change of environmental conditions. With prolonged and cold winter, when metabolism in the bulb is greatly delayed, a greater number of scales is maintained and conversely, with alternating thaws and frosts, the bulbs become considerably exhausted and the number of scales diminishes.

Consequently we consider that the number of annual cycles in the bulb cannot serve as a systematic feature.

Khokhryakov defines the scape as hollow for the first subgenus, whereas the second subgenus is considered as having no cavity. Our study of scapes in all species of **Galanthus** has demonstrated the following. At the first stages of its development its core is filled with colourless parenchyme cells which slime subsequently and a cavity is created inside the scape. No deviations from this type have been observed by us in either of the species.

Consequently, the subgenera are essentially divided on the basis of a single feature, namely, the shape of inner tepals. Sections distinguished by the Khokhryakov are not valid because no characteristics are given for them and there is no justification in discussing the validity of such classification.

The author divides the first section into two subsections, namely, Subsect. **Viridifolii,** green leaves and Subsect. **Glaucifolii,** glaucous leaves. Within the first subsection Khokhryakov distinguishes three series which differ from one another in the width of leaves and the green mark on the inner tepals.

He includes G. fosteri and G. ikariae into the series **Fosteriani. G. Fosteri** actually has a green mark at the base of the inner tepals, whereas no such mark exists in **G. ikariae.** The study of living specimens **G. ikariae** received from England, where they are cultivated in Kew Garden, as well as the description of this species by Baker (1893) and Stern (1956) served as a basis for such a statement.

The series **Alleniani** Khokhr. is characterized by Khokhryakov as follows: "Folia apice albida, obtusata supra glauca infra virida" and he classes with this series such species as **G. alpinus, G. bortkewitschianus, G. schaoricus** which are characterized by leaves glaucous on both sides.

The series **Graeci** Khokhr. is defined as follows: "Folia angusto-lanceolata vel supra glauca". Along with G. graecus characterized by glaucous leaves, the author classes with this series **G. rizehensis, G. cabardensis, G. kemularia** which have bright green leaves. We do not intend to enumerate all the errors admitted by the author in his system. The examples cited are sufficient to prove that the author's approach to this difficult problem was careless and irresponsible.

His attempt to create taxonomy cannot be regarded as serious. One more factor should be emphasized. As a result of such a useless classification of the genus into intrageneric taxons, the series as presented by Khokhryakov are in most cases represented by one species only. Thus, the author's view is inconsistent with the very idea of distinguishing the groups of related substituting species as suggested by Komarov (1940) and, as a matter of fact, Khokhryakov dissociated the groups of related species contemplated in one of our papers (Artyushenko, 1965).

In examining the phylogeny of the genus **Galanthus,** Khokhryakov is of the opinion that the genus has its origin in the tropical bulbous plants.

In his opinion, they are closest to the species of the genus **Haemanthus,** the most primitive genus of the **Amaryllidaceae,** growing in tropical Africa. Even with most superficial comparison of both genera one may be certain, how different they are in appearance.

The morphological features which characterize the genus **Haemanthus** in no way coincide with the data presented by Khokhryakov. So, in the opinion of Khokhryakov, the principal features which bring closer together the genera **Haemanthus** and **Galanthus,** comprise hollow scapes and free tepals. Actually, however the representatives of the genus **Haemanthus** have no hollow scapes and the tepals are coalescent in the lower part forming a tube. Consequently the features of similarity as presented by Khokhryakov are really distinctive characteristics of these genera.

In addition, a number of essential distinctions are available as well. In **Haemanthus** the filaments are long, adnate to the gorge, often longer than the perianth; small anthers; umbelliformis inflorescence with several free bracts; berry-shaped fruit etc. In snowdrops the flowers are solitary, with two united bracts forming a spathe; very short filaments; stamens halved the length of the perianth; free tepals; capsular fruit etc.

We are of opinion that the evolutionary range **Haemanthus-Galanthus** as suggested by Khokhryakov is not confirmed by facts and is essentially wrong.

II. THE PRESENT GROUPING

An enumeration of characters which should be used as the basis for the taxonomy of the genus **Galanthus** was given in our earlier work (Artyushenko, 1965).

The study of anatomical characters of the leaf structure and of epidermal cells especially, made it possible to distinguish two geographical groups of snowdrops—the group which essentially comprises European species and, partially, Asia Minor species (from western portion of Asia Minor) and that of Caucasian-Asia Minor species.

The division of snowdrops into such groups based on anatomical characters and distinctive characteristics of geographical distribution is corroborated also by morphological features. Thus, in all the species of the first group the leaves are glaucous, whereas the snowdrops of the second group have in most cases bright green leaves without any glaucous bloom. As a rule, the presence of glaucous bloom is peculiar to the plants from drier habitats. As a matter of fact, the climatic conditions of Central and Southern Europe where snowdrops with glaucous leaves grow, are characterized by greater dryness as compared with the Black Sea coast and the Caucasian highlands. The snowdrops with glaucous leaves of the Caucasus are also confined to the drier areas (Stavropol hills, Eastern Georgia).

Moreover, almost all snowdrops of the first group are characterized by flat leaves in vernation, whereas most of the species belonging to the second group have leaves convolute in vernation. Finally, all snowdrops of the European group have chromosome numbers $2n = 24$, whereas typical of the Caucasian-Asia Minor group are chromosome numbers $2n = 24$, 36 and 72.

On the basis of the above-mentioned facts, we consider it possible to assign the taxonomic grade of sections to the group revealed by us.

The recognized groups as well as the key for the identification of species are placed under the adopted sections as given below.

Genus GALANTHUS L.

Typus generis: **Galanthus nivalis** L.

Sect. I. **Galanthus**

Syn.—Reihe **Nivales** Beck, (1894), Wiener Ill. Gartenz., 19: 47 p.p.; Reihe **Plicati** Beck, l.c. 56; Sect. **Glaucifolii** Kem.-Nath. (1947), Tr. Tifl. Bot. sada 2, II: 182 p.p.; Sect. **Viridifolii** Kem.-Nath., l.c. 117, p. min. p.; Subgen. **Eugalanthus** Traub et Mold., (1947), Herbertia, 14: 104 p.p. (excl. nonn. sp. plerumqus caus.); Subgen. **Plicatanthus** Traub et Mold., l.c.: 112, p.p.; Ser. **Latifolii** Stern, (1956), Snowdr. and Snowfl., 20 p.p.

Foliorum epiderma e cellulis elongatis plerumque subrhombeis (non rectangularibus) constans. Species Europae mediae et australis ac partis boreali-occidentalis Asiae Minoris.

Leaves glaucous, epidermal cells tapering to the ends. Species growing in Central and Southern Europe and in the north-western part of Asia Minor.

Typus sectionis—**Galanthus nivalis** L.

1. Inner tepals, with single mark at the top, around the sinus 2
+ Inner tepals, with mark at the sinus and with mark at the base ..4
2. Spring flowering 3
+ Autumn flowering 6
3. Leaves flat in vernation, with flat margins ....1. **G. nivalis** L.
+ Leaves flat in vernation, with margins folded back ....6. **G. plicatus** M. B.
4. Leaves up to 0.7 cm. wide ....4. **G. graecus** Orph.
+ Leaves from 1 to 3 cm. wide 5
5. Outer leaf embraces inner leaf in vernation ....5. **G. elwesii** Hook.
+ Leaves flat in vernation with margins folded back ....7. **G. byzantinus** Baker
6. Flowers appear before leaves ....2. **G. reginae-olgae** Orph.
+ Flowers appear simultaneously with leaves ....3. **G. corcyrensis** (Beck) Stern

1. G. nivalis L.

1753, Sp. Pl. 288. Syn.—**G. nivalis** var. **europaeus** Beck 1894, Wiener Ill. Gartenz., 19: 50.

Bulb 1.5-2 cm. long and 1.2-1.5 cm. wide, sheath 6-9 cm. long. Leaves dark green, glaucous, 8-10 cm. long and 0.4-0.6 cm. wide during flowering, up to 25 cm. long and up to 1 cm. wide after flowering. Scape (7—) 9-12 cm. long; spathe 2.5-3 cm. long; pedicel equal to or longer or shorter than spathe. Outer tepals oblong-obovate, 1.5-2.5 cm. long, 0.7-1.1 cm. wide, inner tepals cuneate, 0.7-1.2 cm. long, 0.4-0.7 cm. wide. Stamens 0.6-0.7 cm. long, anther with an apiculus. Ovary 0.3-0.4 cm. in diameter. (Fig. 29). 2n=24[1]

In low, middle and alpine zones; in the outskirts of forests, in bushes, on free spaces.

Distribution: central and southern Europe, Ciscaucasia.

G. nivalis L. ssp. **angustifolius** (G. Koss) Artyush., **comb. n.** Syn.—**G. angustifolius** G. Koss, 1951, Bot. mat. gerbariya Bot. inst. A.N. SSSR, 14: 134.

This species is distinguished from the basic species by the lesser dimensions of the whole plant; these features are maintained under long cultivation. 2n=24.

The northern slopes, at a height of 700 m. above sea level, in bush thickets.

Distribution: Ciscaucasia (Kabardino-Balkarsk Autonomous Soviet Socialist Republic).

2. G. reginae-olgae Orph.

1874 (1876), Atti Congr. Intern. Bot. Firenze, 214. Syn.—**G. olgae** Orph., Boiss., 1884, Fl. Or., 5: 146; **G. olgae-reginae** Hort., 1888, ex Gard. et For. 1: 499; **G. nivalis** f. **olgae** (Boiss.), G. Beck, 1894, Wiener, Ill. Gartenz., 19: 51; **G. nivalis** ssp. **reginae-olgae** (Orph.) Gottlieb-Tannenhain, 1904, Abh. Zool.—Bot. Ges. Wien, 2, 4: 32.

Bulb 2 cm. long, 1.5 cm. in diameter; sheath 3-4 cm. long. Leaves green, glaucous, linear, 15 cm. long, 0.6-0.8 cm. wide, appear after flowering (September-October). Scape 9-11 cm. long; spathe 2.5 cm. long; pedicel equal to spathe in length. Outer tepals broad, lanceolate, concave, 2.3-2.5 cm. long and 0.8 cm. wide, inner tepals obovate, with rounded parts of sinuous top, 1.2 cm. long, 0.6 cm. wide. Stamens 0.5-0.6 cm. long, anther with an apiculus. 2n=24.

In the outskirts of fir and spruce forests, in ferns.

Distribution: Greece.

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[1] Chromosome numbers for snowdrops are given according to L. I. Sveshnikova's data (1965, 1967).

3. G. corcyrensis (Beck) Stern

1956, Snowdr. and Snowfl., 34; Syn.—**G. praecox** Hort., 1891, Allen, Journ. R. Hort. Soc., 13: 180, **nomen nudum; G. corcyrensis** Shortt, 1883, Gard. Chron. New Ser., 20: 728, **nomen nudum;** Baker, 1888, Handb. Amaryll., 17, **nomen nudum;** Leichtlin, 1888, in Le Jardin, 2: 139; **G. nivalis** f. **corcyrensis** G. Beck, 1894, Wiener Ill., Gartenz., 19: 51; **G. nivalis** f. **corcyrensis** Halaczy, 1904, Consp. Fl. Graec., 3: 206; the same author, 1908, Suppl. N 1: 103; **G. imperati** f. **australis** Zodda, 1904, Fl. Ital. Exicc. N 726.

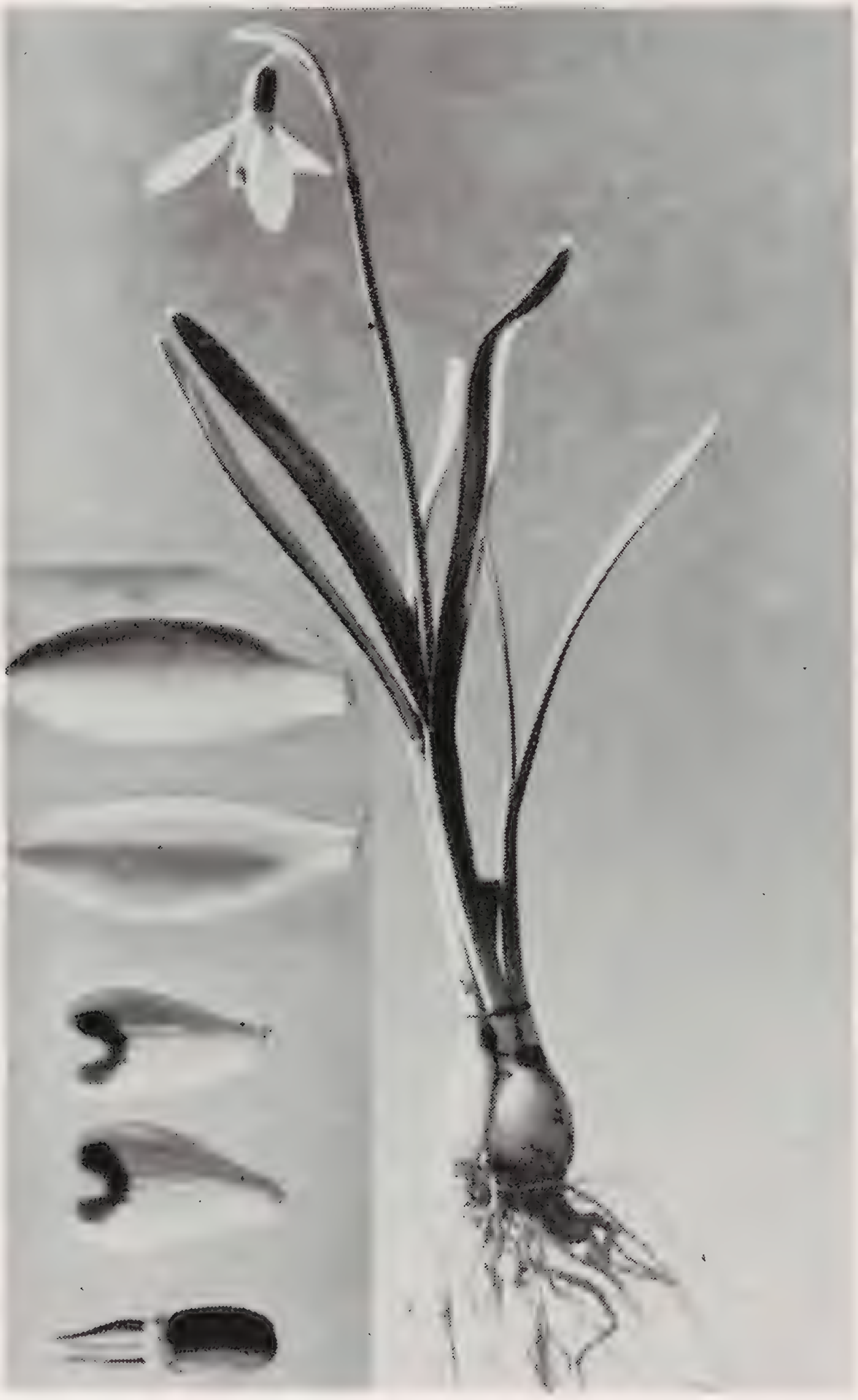

Fig. 29. **Galanthus nivalis** ssp. **angustifolius** from the suburbs of Nalchik: **right,** general view of the plant; **to side, lower left,** parts of the flower.

Bulb 1.5 cm. long and 1.5 cm. in diameter; sheath up to 4 cm. long. Leaves green, glaucous, linear, with blunt and flat tip, appearing in November simultaneously with flowering; up to 18 cm. long and 0.6 cm. wide. Scape more than 8 cm. high; spathe 3 cm. long; pedicel 2.5 cm. long. Outer tepals narrow, oblong, 2.1 cm. long and 0.9 cm. wide; inner tepals cuneate, 1.1 cm. long and 0.5-0.6 cm. wide, with a green mark around the sinus at the top. Stamens about 0.5 cm. long, anther with an apiculus. 2n = 24.

Native habitat unknown.

Distribution: The islands of Corfu and Sicily.

4. G. graecus Orph.

1884, ex Boiss., Fl. Or., 5: 145; Syn.—**G. nivalis** subsp. **graecus** (Orph. ex Boiss.), Gottlieb-Tannenhain, 1904, Abh. Zool.—Bot. Ges. Wien, 2, 4: 40; **G. bulgaricus** (Velen. ined. 1886) Velen., 1891, Fl. Bulgar., 539; **G. gracilis** Celak., 1891, Sitzungsb. k. Böhm. Ges. Wiss. Math-nat. Cl., 9, 184: 198.

Bulb 1.5 cm. long, 1-1.2 cm. in diameter; sheath 3.5 cm. long. Leaves green, glaucous, always wavy, up to 7 cm. long and 0.5-0.7 cm. wide during flowering. Scape 7-9 cm. long; spathe up to 3 cm. long; pedicel equal to or longer than spathe. Outer tepals obovate, about 2.5 cm. long and 0.7 cm. wide, inner tepals narrow cuneate, 1.1 cm. long, about 0.5 cm. wide. Stamens about 0.7 cm. long, anther with an apiculus. 2n = 24.

In the foothills and mountains, along outskirts of forests and in forests.

Distribution: Greece, Bulgaria, Rumania.

5. G. elwesii Hook.

1875, Curt. Bot. Mag., 101, t. 6166. Syn.—**G. elwesii** var. **whittalii** Arnot, 1898, Gard. Chron., ser. 3, 24: 466.

Bulb 2.5-3 cm. long and 1.8-2.2 cm. diameter; sheath up to 5 cm. long. Leaves green, glaucous, 7-10 cm. long, 1.5-3 cm. wide, with a cucullus on the top. Scape 10-13 cm. long; spathe 3-3.5 cm. long; pedicel 2-2.5 cm. long. Outer tepals broad obovate, about 2 cm. long, 1.3 cm. wide, inner tepals oblong, slightly widening towards the top, 1.1 cm. long, about 0.6 cm. wide, with a green mark around the sinus at the top and at the base. Stamens about 0.7 cm. long, anther with an apiculus. 2n = 24, 48.

Confined to mountain habitats.

Distribution: Europa (Bulgaria, Roumania, Moldavia), Asia Minor and islands in Aegean Sea.

F. Stern recognizes a variety, established by Beck, for the North Greece, Bulgaria and Yugoslavia, attaching to it the following synonimics and features:

G. elwesii var. **maximus** (Velen.) Beck G., 1894, Wiener Ill. Gartenz., 19: 55; Syn.—**G. maximus** Velen., 1891, Fl. Bulgar., 540; **G. graecus** Orph. var. **maximus** (Velen.) Hayek, 1932, Prod. Fl. Balcan., 3: 102.

This variety distinguishes from G. elwesii by waviness of leaves, inherent to G. graecus, and by leaves from 1 cm. to 1.5 cm. wide, rarely 2 cm. wide. The study of this variety in nature has shown that a series of transition forms is available from the typical **G. elwesii** to **G. graecus.** This circumstance allows to assume that **G. elwesii** var. **maximus** is a hybrid between the two mentioned species. It is envisaged to study this problem thoroughly in future (in collaboration with D. D. Delipavlov).

6. G. plicatus M. B.

1819, Fl. Taur.-Cauc., 3: 225. Syn.—**G. nivalis** subsp. **plicatus** (M. B.) Gottlieb-Tannenhain, 1904, Abh. Zool.—Bot. Ges. Wien. 2, 4: 35; **G. latifolius** Salisb., 1866, Gen. Pl. 95, non Rupr.; **G. plicatus** var. **excelsior** G. Beck, 1894, Wiener Ill. Gartenz., 19: 57.

Bulb 2-3 cm. long, 2-2.8 cm. in diameter; sheath 4-6 cm. long. Leaves green, glaucous, linear, with margins folded back and flat against each other in vernation, 8-12 cm. long and 0.4-0.8 cm. wide during flowering. Scape 12-16 cm. long; spathe 3-5 cm. long; pedicel 2.5-3.5 cm. long. Outer tepals broad elliptical, spoon-shaped, tapering to the base, 2.5-3 cm. long, 1.8-1.5 cm. wide, inner tepals cuneate, 1-1.1 cm. long and 0.8-1 cm. wide, with a green mark around the sinus at the top. Stamens 0.7 cm. long, anther with an apiculus. 2n = 24.

In foothills and mountains, in the outskirts of forests, in bushes.

Distribution: Roumania, Moldavia, the Crimea.

7. G. byzantinus Baker

1895, Gard. Chron., Ser. 3, 13: 226. Syn.—**G. plicatus** var. **byzantinus** (Baker) G. Beck, 1894, Wiener Ill. Gartenz., 19: 57; **G. nivalis** subsp. **byzantinus** (Baker) G. Beck; Gottlieb-Tannenhain, 1904, Abh. Zool.—Bot. Ges. Wien, 2, 4: 41.

Bulb 2 cm. long and 2.5 cm. in diameter; sheath 8 and more cm. long. Leaves green, glaucous, lanceolate, with margins folded back and flat against each other in vernation. Scape 11 cm. long; spathe 4 cm. long; pedicel 3 cm. long. Outer tepals broad elliptical, spoon-shaped, tapering to the base, 2.2 cm. long and 1.2 cm. wide; inner tepals cuneate, 1.1 cm. long, with a mark at the top around the sinus and at the base. Stamens 0.8 cm. long, anther with an apiculus. $2n = 24$.

Open, sodded places, in bushes.

Distribution: Asia Minor: Bosporus, Asian coast, Göksu.

Sec. 2. **Viridifolii** Kem.-Nath.

1947. Tr. Tifl. Bot. sada, Ser. 2, 11: 177. emend. Artyush., hoc loco.

Syn.—Reihe **Nivales** G. Beck, 1894, Wiener Ill. Gartenz., 1947, p.p.; Sect. **Glaucifolii** Kem.-Nath., l.c. 182, p. min. p.; Subgen. **Plicatanthus** Traub et Mold., 1947, Herbertia, 14: 112.; Subgen, **Eugalanthus** Traub et Mold., l.c., 104, p. min. p.; Ser. **Latifolii** Stern, 1956, Snowdr. and Snowfl., 20, p.p.

Foliorum epiderma e cellulis rectangularibus constans. Species Caucasi et Asiae Minoris /parte euis boreali-occidentali exclusa/.

Leaves glaucous, shiny or matt-surfaced, with rectangular epidermial cells. These snowdrops grow in the Caucasus and Asia Minor, with the exception of the north-eastern part of the latter.

Lectotypus sectionis **G. platyphyllus** Traub et Mold. (Syn.—**G. latifolius** Rupr.)

1. Leaves unglaucous 2
+ Leaves glaucous 8
2. Leaves flat in vernation 3
+ Outer leaf embraces inner leaf in vernation 5
3. Leaves bright green .... 10. **G. lagodechianus** Kem.-Nath.
+ Leaves dull but without glaucous bloom 4
4. Outer tepals about 2 cm. long .... 9. **G. cilicicus** Baker.
+ Outer tepals from 2 to 2.5 (3) cm. long .... 8. **G. transcaucasicus** Fomin.
5. Inner tepals with a sinus at the top 6
+ Inner tepals without a sinus at the top 7
6. Inner tepals with a green mark only under a sinus .... 4. **G. ikariae** Baker.
+ Inner tepals with a green mark under a sinus and at the base .... 7. **G. fosteri** Baker.
7. No anther apiculus; inner tepals with a rounded top .... 5. **G. platyphyllus** Traub et Mold.
+ Anther with an apiculus; inner tepals with a rounded or obtuse top .... 6. **G. krasnovii** Khokhr.
8. Leaves 2-2.5 cm. wide 9
+ Leaves 1-1.6 cm. wide, as a rule . . 1. **G. caucasicus** (Baker) Grossh.
9. Flowers up to 1.5 cm. long; fruits not developed .... 3. **G. bortkewitschianus** G. Koss.
+ Flowers from 1.5 to 2 cm. long; fruits developed 2. **G. alpinus** Sosn.

1. G. caucasicus (Baker) Grossh.

1924, Pl. Or. Exsicc., Fasc. 1:4. Syn.—**G. nivalis** ssp. **caucasicus** Baker, 1887, Gard. Chron., Ser. 3, 10: 313; **G. nivalis** f. **major** (Redoute) Rupr., 1868, Gartenfl., 17: 131.

Bulb 2.4-4 cm. long, 1.5-2 cm. in diameter; sheath /2/ 4.5-5.5/8/ cm. long. Leaves dark-green, glaucous, linear, /2/ 4-6.5 /8/ cm. long and 1 cm. wide during flowering, /10/ 12-15 /18/ cm. long and 1-4 cm. wide after flowering, with a nearly flat top. Scape 5-6 cm. long; spathe 2.5-3.5 cm. long; pedicel slightly shorter than spathe. Outer tepals concave, obovate /1.5/ 1.7-2 cm. long, 0.8-1 /1.2/ cm. wide; inner tepals cuneate, 0.8-0.9 cm. long and 0.5-0.6 cm. wide, with a mark around the sinus at the top. Stamens 0.6-0.7 cm. long, anthers with a small mucronatum. Ovary 0.3-0.7 cm. in diameter (Fig. 30, left and upper center). 2n=24.

In mountain forests of middle and low zones.

Distribution: The central Transcaucasia /district of Tbilisi/, the western zone of Ciscaucasia /district of Stavropol/.

2. G. alpinus Sosn.

1911, Vestnik. Tifl. Bot. Sada, 19: 28. Syn.—**G. schaoricus** Kem.-Nath., 1947. Zam. po sist. i geogr. rast., 13: 6.

Bulb 2.0-2.5 /3.5/ cm. long and 1.5-2 cm. in diameter; sheath 3.5-6 cm. long. Leaves dark-green, glaucous, broad lanceolate, /4/ 5-5.5 /7/ cm. long and 1.5-1.8 cm. wide during flowering, up to 25 cm. long and 2-2.5 cm. wide after flowering. Scape 6-9 cm. long, with fruits 12-14 cm. long; spathe 3.5-5 cm. long; pedicel slightly shorter than spathe. Outer tepals concave, obovate, 1.5-2 cm. long and 0.8-1 cm. wide; inner tepals cuneate, 0.8-0.9 cm. long, 0.5-0.6 cm. wide, with a sinus at the top and with a green mark around the sinus. Stamens 0.6-0.7 cm. long; anthers with small mucronatum. Ovary 0.5 cm. in diameter. 2n=24.

From low to alpine zones, in bushes thinned as a result of sheepherding, on exposures of limestone rocks, in alpine pasturable meadows.

Distribution: The western Transcaucasia, district of the Shaorsky reservoir; the south-western part of the Transcaucasia, districts of Borzhomi, Bakuriani, Keda.

3. G. Bortkewitschianus G. Koss

1951, Bot. mat. gerbariya Bot. inst. A.N. SSSR, 14: 130.

Bulb 3-4 cm. long, 2-3 cm. in diameter; sheath 3-6 cm. long. Leaves dark-green; glaucous, lanceolate, from 2.5 to 6 cm. long and 1.2-1.4 cm. wide during flowering; up to 30 cm. long and 2.5 cm. wide after flowering. Scape 4-6 cm. long; spathe 2.5-4 cm. long; pedicel equal to or slightly longer than spathe. Outer tepals concave, obovate, 1.5 cm. long and 0.8-1 cm. wide; inner tepals cuneate 0.8-0.9 cm. long, 0.5-0.6 cm. wide, with a sinus at the top and with a green mark around the sinus. Stamens 0.6-0.7 cm. long; anthers with small mucronatum. Ovary 0.3-0.4 cm. in diameter. 2n=36.

The plant grows under the cover of beech forest, on loose humus soils.

Distribution: Ciscaucasia, upper reaches of the river Kamenka, where an area of 5-6 hectares is occupied by this species; the plant is not found in other places.

4. G. ikariae Baker

1893, Gard. Chron., Ser. 3, 13: 506. Syn.—**G. woronowii** Losinsk. 1934, Flora USSR, 4: 794; **G. ikariae** subsp. **ikariae** Stern, 1956, Snowdr. and Snowfl., 48.

Bulb 2-3 cm. long and 2-2.5 cm. in diameter; sheath 2-5 cm. long. Leaves 12-16 cm. long, 1-2 cm. wide, during flowering, 18-22 cm. long after flowering, bright-green, with yellowish hue, glossy, slightly coiled. Scape 10-15 cm. long; spathe 2.5-4.5 cm. long; pedicel 2-3 cm. long. Outer tepals obovate, slightly concave, 1.5-2.4 cm. long, 0.8-1.0 /1.2/ cm. wide; inner tepals oblong, widening toward the top, 0.8-1.0 cm. long and 0.4-0.5 cm. wide, with a sinus and a green mark at the top. Stamens 0.6-0.7 cm. long, anthers with mucronatum at the top. Ovary 0.3-0.5 cm. in diameter, (Fig. 30, right, and lower center). 2n=24.

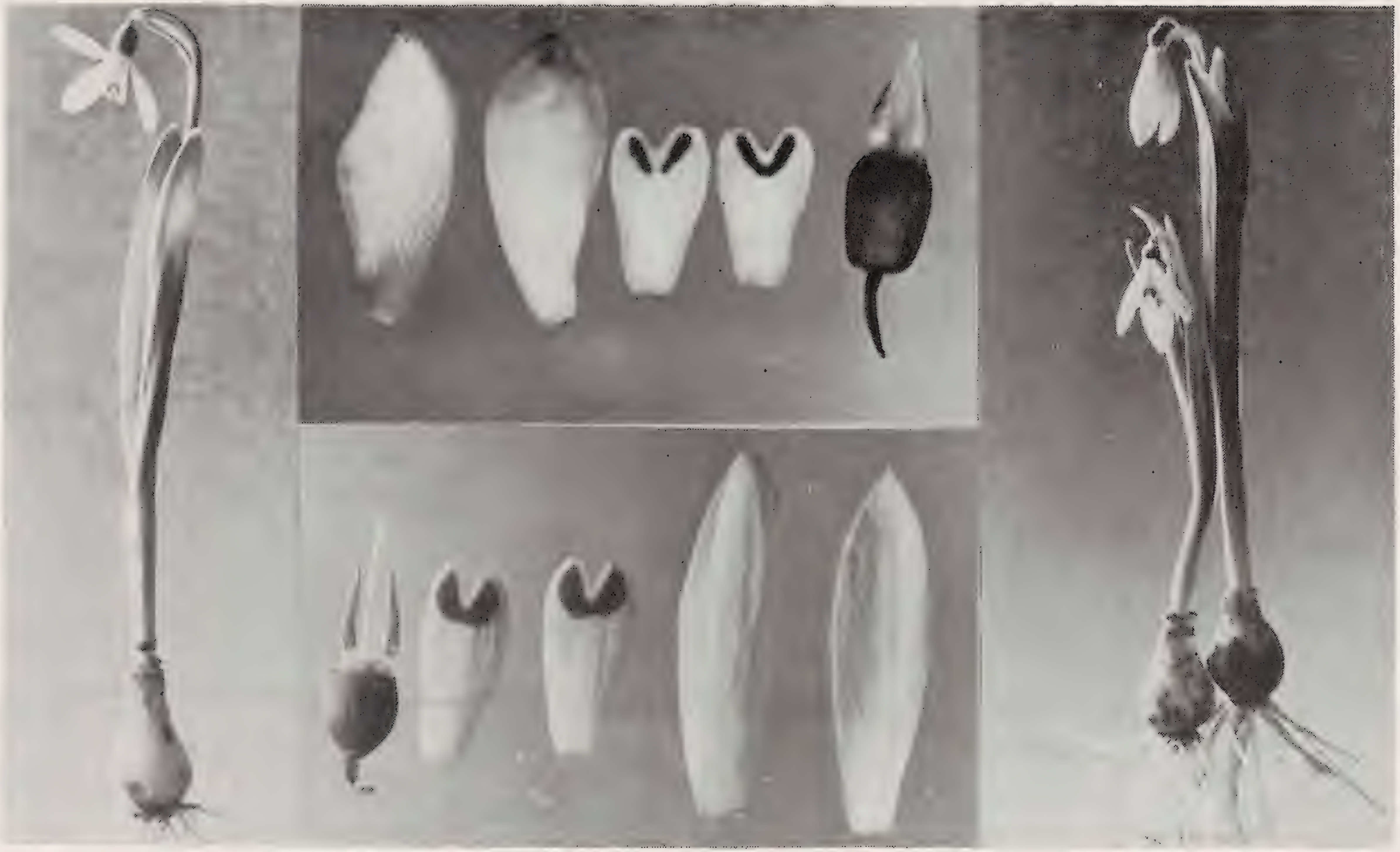

Fig. 30. **Galanthus caucasicus** from the suburbs of Tbilisi **left,** general view of the plant; **upper center,** parts of the flower.

Galanthus ikariae (G. woronowii) from the suburbs of Sukhumi: **right,** general view of the plant; **lower center,** parts of the flower.

In forests on foothills, on the Black Sea coast of the Caucasus the plant grows together with **G. krasnovii.**

Distribution: The western Transcaucasia—from Tuapse to Batumi, the eastern part of the Black Sea coast of Turkey, the island of Ikaria.

5. G. platyphyllus Traub et Mold.

1947, Herbertia, 14: 110; **G. latifolius** Rupr. 1868, Gartenfl. 17: 130; **G. ikariae** subsp. **latifolius** Stern, 1956, Snowdr. and Snowfl., 50.

Bulb 4-5 cm. long and 2.5-3 cm. in diameter, sheath 3-5 cm. long. Leaves dark-green, shiny, 15-16 cm. long and 1-1.5 cm. wide during flowering, 20-25 cm. long and 3-3.5 cm. wide after flowering. Scape 10-15 /20/ cm. long, 20-22 cm. long after flowering; spathe 3-5 cm. long; pedicel 1.5-2 cm. long. Outer tepals elliptical or oblong-ovate, 1.8-2.7 cm. long, 0.8-1.5 cm. wide, with an apiculus at the top; inner tepals obovate 0.8-1 cm. long and 0.5 cm. wide, without a sinus at the rounded top, with a green mark of indefinite shape. Stamens 0.4-0.5 cm. long, without an apiculus at the top; ovary 0.3-0.4 cm. in diameter. $2n=24$.

In subalpine and alpine zones, snowdrops descend sometimes along slopes into gorges.

Distribution: western part of the Greater Caucasus from Gagry range in eastern direction to places slightly eastwards of the Krestovy pass.

6. G. krasnovii Khokhr.

1963, Bull. Mosk. obstsch. ispyt, prir., 63, 4: 140; Syn.—**G. valentinae,** 1940, Fl. Kavkasa, 2: 194.

Bulb 2-2.5 (3.5) cm. long, 2-2.5 cm. in diameter; sheath (2.5) 6-9 cm. long. Leaves 10-18 cm. long, 1-2 cm. wide during flowering, bright-green, glossy, slightly coiled. Scape 12-15 cm. long, up to 30 cm. long after flowering; spathe 2.5-4 cm. long, with slightly expressed green keels; pedicel 2-3 cm. long. Outer tepals obovate, slightly concave, 1.5-2 /3/ cm. long, 0.8-1.2 cm. wide, inner tepals lanceolate, 1-1.5 cm. long, 0.4-0.6 cm. wide, with an obtuse or acuminate top and with a diffused green mark at the top. Stamens 0.5-0.7 cm. long, anther with an apiculus. Ovary 0.4-0.5 cm. in diameter. $2n=24$.

In beech, hornbeam and mixed forests, in glades, on the floors of damp gorges.

Distribution: the Caucasus—the Black Sea coast of the Caucasus (from Novy Afon to Batumi); Turkey-Artvin district.

7. G. fosteri Baker

1889, Garden Chron., Ser. 3, 5: 458; Syn.—**G. latifolius** Rupr. f. **fosteri** (Baker) G. Beck, 1894, Wiener, Ill. Gartenz., 19: 56.

Bulb 2.5 cm. long, 2 cm. in diameter; sheath up to 5 cm. long. Leaves dark-green, 15-17 cm. long and 1.7-2.6 cm. wide, turned back, with a flat top. Scape up to 9 cm. height; spathe 6 cm. long; pedicel up to 3.6 cm. long. Outer tepals oblong-obovate 2.6 cm. long, 1.2-1.5 cm. wide, inner tepals oblong-obcuneate, 1.2 cm. long, 0.6 cm. wide, with a green mark around a sinus at the top and at the base. Stamens about 0.6 cm. long; anther with an apiculus. $2n=24$.

In foothills and mountains, in the outskirts of forests, in bushes.

Distribution: Turkey and Lebanon.

8. G. transcaucasicus Fomin

1907, Opred, rast. Kavkasa i Kryma, 1: 281; Syn.—**G. nivalis** f. **caspius** Rupr., 1868, Gartenfl., 17: 132; G. caspius (Rupr.) Grossh., 1928, Flora Kavkasa, 1: 244.

Bulb 1.5-2 (2.5) cm. long, 1.2-1.5 cm. in diameter. Sheath 4-6 /8/ cm. long. Leaves dark-green, matt-surfaced, but without waxy bloom, linear, 10-14 cm. long and 0.5-1 cm. wide during flowering, 20-25 cm. long and 1.2-2.2 (2.5) cm. wide after flowering. Scape 8-10 (13) cm. long; spathe 2.5-3 cm. long; pedicel equal to or slightly longer than spathe (in rare cases shorter than spathe). Outer tepals obovate, 1.5-2.5 /3/ cm. long and 0.7-1 cm. wide, inner tepals 0.8-1 cm. long, 0.5-0.6 cm. wide, with a green mark around a sinus at the top. Stamens 0.6-0.7 cm. long, anthers with an apiculus at the top. Ovary 0.3-0.5 cm. in diameter. 2n=24.

In the forests of foothills.

Distribution: the Caucasus-Talysh mountains, The Lesser Caucasus.

9. G. cilicicus Baker

1897, Gard. Chron., Ser. 21: 214. Syn.—**G. nivalis** subsp. **cilicicus** (Baker) Gottlieb-Tannenhain, 1904, Abh. Zool.—Bot. Ges. Wien, 2, 4: 33; **G. rizehensis** Stern, 1956, Snowdr. and Snowfl., 37; **G. glaucescens** Khokhr., 1966. Bull. GBS., 62: 62.

Bulb 1.5-2.2 cm. long and 2 cm. in diameter; sheath 4-6.5 cm. long. Leaves dark-green, matt-surfaced, but without glaucous bloom, linear, 10-12 cm. long, and 0.4-0.5 cm. wide during flowering, and 20-25 cm. long and up to 1 cm. wide after flowering. Scape 12-18 cm. long; spathe 2.5-3 cm. long; pedicel equal to or longer than spathe. Outer tepals oblong-oval, tapered to the base, 1.9-2.1 cm. long, 0.6-0.8 cm. wide, inner tepals oblong, widened at the top, 0.9-1 cm. long 0.4-0.6 cm. wide, with a green mark around a sinus at the top. Stamens 0.7 cm. long, anther with an apiculus. Ovary 0.5 cm. in diameter. 2n=24, 36.

In foothills and mountains, in the outskirts of forests, in bushes.

Distribution: Asia Minor—district of Trabson and Cilicia, the Caucasus (suburbs of Batumi).

10. G. lagodechianus Kem.-Nath.

1947. Zam. po sist. i geogr. rast. instituta bot. A. N. Gruz. SSR. 13: 5. Syn.—**G. ketzkhowelii** Kem.-Nath., 1947, Tr. Tbil. Instituta bot., Ser. 2, 11: 181; **G. cabardensis** G. Koss 1951. Bot. mat. gerbar. bot. Instituta A. N. SSSR, 14: 133; **G. kemulariae** Kuth., 1963, Zam. po sist. i geogr. rast. Instituta bot. A. N. Gruz. SSR, 23: 128.

Bulb 2.5-3 cm. long and 1.5-2 cm. in diameter; sheath 4-6 (9) cm. long. Leaves flat, dark green, shiny, without glaucous bloom, linear; 10-12 cm. long and 0.6-0.8 cm. wide during flowering; after flowering 20-30 (45) cm. long and 1-1.5 cm. wide. Scape (3) 8-10 cm. long; spathe 3-4 cm. long; pedicel equal to or slightly shorter than spathe. Outer tepals obovate, (1.5) 2-2.5 (3) cm. long and 0.8-1 cm. wide; inner tepals cuneate, 0.8-1 (1.2) cm. long and 0.4-0.6 cm. wide, with a sinus at the top and a green mark around it. Stamens 0.6-0.8 cm. long; anthers with an apiculus on the top. Ovary 0.4-0.5 cm. in diameter. 2n=24.

From subalpine to lower forest zone.

Distribution: the Caucasus—Greater Caucasus (regions of Nalchik, Ordzhonikidze, Khasavyurt, Lagodekh, Zakataly, Nukha, vicinity of Tbilisi—monastery Zedazeni).

As regards the origin of the species belonging to the genus Galanthus, the following can be said. The most likely assumption suggested by F. C. Stern (1949, 1956) is that the genus Galanthus has emerged from an ancestral group common to the genus Leucojum which was confined to the Northern and Central Europe, but shifted to the south (Spain, Portugal, North Africa) and east (The Caucasus, Asia Minor) under the effect of glaciation. From this ancestral group the genus

Leucojum has emerged in the western part of the Mediterranean area and the genus Galanthus—in the eastern part of the latter.

This view is confirmed by chromosome number data. In the genus Leucojum the series of basic chromosome numbers is from 7 to 11 and the basic number in snowdrops continues the ascending series.

The evolution of the genus Galanthus can be represented as follows. We consider the most ancient group of snowdrops as constituted by species from the section Nivales characterized by flat leaves in vernation, epidermal cells tapering to the ends and large cavities in the leaves. All these features are also inherent in the species of the genus Leucojum, whose areas alternate with those of some of the snowdrop species.

The representatives of the section Viridifolii are characterized by rectangular epidermal cells, some of the species have no clearly defined cavities in the leaves; vernation within the section is of two types, but species with vernation inherent in snowdrops of the series *Latifolii* are predominant. The polyploid series 2n=24, 36, 72 is especially noteworthy for this section.

The presence of polyploids in the section is in itself a sufficient proof that this is a younger group of snowdrops. It should be noted that in the Caucasus the species with chromosome numbers equal to 36 and 72 are confined to the Greater Caucasus which was affected by considerable glaciation in the Quaternary period, whereas the lowlands of Kolkhida were not affected by glaciation. And it is there that the most ancient snowdrops such as *G. ikariae* have been preserved.

We do not attach evolutionary significance to the feature of presence or absence of waxy bloom on the leaves as assumed by Kemularia-Natadze (1947). Rather this is a feature of ecological importance inherent in drier habitats of snowdrops more exposed to sun.

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LATIN AMERICAN AMARYLLIDS, 1969

PEDRO FELIX RAVENNA, *Argentina*

Amaryllis aviflora Ravenna, Sellowia 19: 25. 1967. (subgen-*Omphalissa*). Plant about 40 cm high. *Bulb* nearly globose, 6 cm wide, prolonged in a neck about 2-3 cm long. *Leaves* 2-6 at flowering time or serotine, green, somewhat flaccid, about 38 cm long, 3-4 cm wide, somewhat canaliculate down to the base, nearly flat upwards. *Scape* cylindric, lateral, about 6-11.5 mm wide, with dry spathe-valves at anthesis. *Flowers* horizontal or cernuus, about 9 cm long, nearly 6.5-7 cm in diameter, whitish with green throat and red nerves inside. *Ovary* oblong about 11.5 mm long, 7.2 mm wide. *Tepals* connate about 14 cm, the outer ones about 7.5 cm long and 2-2.2 cm wide, somewhat reflexed at the apex, the inner lateral nearly oblanceolate, about 6.7 cm long, 13 mm wide, curved outwards, the lower outer pair contiguous to the lower inner, this much smaller than the others, appressed to the fascicle of stamens. *Filaments* ascendent, curved upwards, whitish. *Anthers* versatile reniform after dehiscence, about 5 mm long; pollen pale yellow. *Style* declinate-ascending about 10 cm long; stigma shortly trifid, lobes about 2.5 mm long.

Hab. and exsiccata: Cultivated in Buenos Aires from bulbs collected by Lic. E. Nicora between Trancas and Rosario de la Frontera, province of Salta (Argentina); flowered Oct. 1962; leg. Ravenna 148 (type in Herb. Ravenna).

A very pretty species similar to *Amaryllis maracasa* Traub; however, this has orange or brick-red flowers. It has also some resemblance to *A. calyptrata* Ker-Gawl., differing by the disposition of the lower tepals (two of the outer and the lower inner), which in *A. aviflora* are contiguous.

The use here of the name *Amaryllis* instead of *Hippeastrum* (synonym) agrees with the 13th article of the International Code of Nomenclature. The existence of an unannoted African specimen (*Brunsvigia rosea*) in the Cliffort Herbarium does not affect the Linnean concept in considering the American species *Amaryllis belladonna* Linn. (syn. *Hippeastrum equestre* Herb.) as the type of the genus *Amaryllis.* Any attempt to select a lectotype which could be at variance with the Linnean opinion goes against the 8th article of the mentioned Code. Actually the work ''Hortus Cliffortianus'' of the famous botanist is not based only on that herbarium, but includes many other species, and among them our American species.

In the last edition (1966) of the Code of Nomenclature, is published the name *Hippeastrum* Herb. (1821) against *Leopoldia* Herb. (1821, nom. prov.); hereby must be understood that the former appears as valid rather than the latter, but even so, the status of the earlier name *Amaryllis* Linn. is not affected.

Amarryllis angustifolia (Pax) Traub et Uphof. Pax says at the end of the original description, that it is intermediate between the subgenera *Omphalissa* and *Habranthus* (the latter is considered as a different genus). Traub and Moldenke (1949) include it in the subgenus *Lais.* This is in disagreement with the flower characters. In fact the very narrow tepals, the lower embracing the stamens near the base, these very long and prominent, are evidence enough supporting the transference of the species to the subgenus *Omphalissa.* The inflorescence has four to nine magnificent red flowers, very similar in shape to those of *Sprekelia formosissima. Sprekelia spectabilis* Hoehne is a synonym which proves the existence of it also in Brazil. *Hippeastrum rutilum* in the sense of Hassler and Chodat (Bull. Herb. Boiss. ser. 2, 12: 1101. 1903) is also the same still not reported to Paraguay.

Zephyranthes flavissima Ravenna, Sellowia 19: 28. 1967. (subgen. *Zephyranthes*). Plant about 10-20 cm high. *Bulb* ovoid about 16-17 mm long, 13-14 mm wide, prolonged in a neck about 35-40 mm long. *Leaves* often two at flowering time, bright green somewhat thick, nearly flat in the adaxial face, about 12-18 cm long, 2-2.3 mm wide. *Scape* about 7-18 cm long. *Spathe* somewhat reddish, tubular downwards, fenestrated near the apex, about 17 mm long. *Flower* widely funnel-shaped, intensely yellow, pedicellate (pedicel about 11 mm long), nearly 3.5-4 cm in diameter. *Ovary* obovoid, green, about 2.9 mm long, 2 mm wide. *Tepals* oblanceolate-spathulate or oblanceolate, connate about 1.9 mm, the outer about 2.4 cm long and 7 mm wide, the inner about 2.3-2.35 cm long, 6.1 mm wide. *Filaments* somewhat broadish, sepalines about 9.9 mm long, petalines about 11.5 mm long. *Style* erect, straight, as long as the stamens or somewhat longer; stigma capitate, obscurely trilobed.

Habitat.—Stony grassy fields on Serra da Rocinha (Brasil, R. G. do Sul), about 1060 m over sea level; Serra do Oratorio, Santa Catarina, about 1440 m; also in Entre Ríos, Argentina, on stony banks of the river Uruguay, near the water or covered with it (at Parque Rivadavia, near Concordia), and in the prov. of Corrientes and Misiones.

Hab.—Stony grassy fields of the Rocinha mountains (Rio Grande do Sul, Brazil), about 1060 m above sea level; also in the Oratorio Mountains in Santa Catarina, about 1440 m and in the State of Paraná; in the province of Entre Ríos, Argentina, among stones near or under the water at the river Uruguay banks, in the Rivadavia Park near Concordia; also in the provinces of Corrientes and Misiones.

Zephyranthes stellaris Ravenna, Sellowia 19: 28. 1967. (subgen. *Zephyranthes*). Plant about 17 cm high. *Bulb* ovoid, about 20 mm long and 14-15 mm wide or smaller, covered with dull ochraceous coats. *Leaves* suberect, green, nearly filiform or very slightly canaliculate, smooth, about 17 cm long and 1.15 mm wide. *Scape* about 17 cm long. *Spathe* tubular 1-valved, undivided to the apex, 1-flowered, about 14-18 mm long. *Flower* white, greenish at the base, rotaceous, about 4 cm in diameter. *Tepals* oblanceolate, connate about 0.8-1 mm, the outer about 25.5 mm long, 7.6 mm wide, the inner about 24 mm long, 8 mm wide. *Filaments* nearly erect three about 8 mm long, the other three nearly 9.9 mm long. Anthers nearly straight after dehiscence, or somewhat curved, about 3 mm long. *Style* ascendent about 11 mm long; stigma capitae-trilobed. Related to *Zephyranthes candida.* People know it as "vivina"; bulbs are supposed to be edible.

Hab.—In damp grassy places among *Prosopis,* in the Argentinean provinces of Entre Ríos, Santa Fé and Misiones; also in Paraguay near Villa Rica.

Bulbs of this species were taken from some "dry" specimens which were covered with poison two years before. One of these flowered after several months. By the shape of its perigonium, anthers and stigma, it rather resembles *Z. candida.* It is easily distinguishable by its nearly filiform leaves and the very weak habit of the whole plant. According to the collectors the bulbs are edible.

Zephyranthes filifolia Herbert ex Kraenzlin. According to Baker (1888) the name *Zephyranthes filifolia* was proposed by Herbert, but never published. The first description with that name was made by Kränzlin using a specimen from northern Patagonia (at Kew). In fact the species was recently re-collected in the province of Río Negro. However, it has a much wider distribution to the north, through the provinces of La Pampa, Buenos Aires, Mendoza, Córdoba, San Luis and Catamarca. Therefore it seems necessary to draw its geographical distribution by means of the specimens determined by me.

Habranthus andalgalensis Ravenna, Sellowia 19: 30. 1967. Plant about 23-25 cm high. *Bulb* nearly globose or globose, about 27 mm wide, covered with dark tunics, these prolonged in a neck. *Leaves* 3-4 at floweringtime, or none, filiform, ash green, narrowly canaliculate, about 15-20 cm long, 2 mm wide. *Scape* cylindric, weak, about 12-13 cm long. *Spathe* 1-valved, 1-flowered; valve membranaceous, very often undivided, about 3 cm long, tubular downwards for 5-10 mm. *Flower* cernuus pedicellate (pedicel about 6-12 mm long), whitish, about 4.5 cm long, 3-4 cm in diameter. *Ovary* oblong, about 4.7 mm long and 2.5 mm wide. *Tepals* oblanceolate, somewhat connate at the base, the outer about 44 mm long, the inner about 42.5 mm long, nearly 11.5 mm wide. *Stamens* fascicled, declined, the shorter pair about 13 mm long, the longer pair nearly 23 mm long, the intermediate ones about 19 mm and 21 mm long; anthers curved semilunate, about 3 mm long. *Style* declinate about 28 mm long; stigma shortly trifid, lobes about 1.6 mm long recurved at the apex.

Hab.—In sandy places among prickly bushes near Andalgalá (prov. of Catamarca, Argentina), in a place known as La Aguada.

This species resembles somewhat *H. gracilifolius* Herb. It can be easily identified because of the narrowly channeled grayish leaves, which frequently appear at the same time as the flowers. These are whitish, not pink. The range and habit of both are quite different.

Habranthus magnoii Ravenna, Sellowia 19: 31. 1967. Plant about 20 cm high. *Bulb* ovoid or nearly ovoid, about 3 cm long, 2 mm wide, or smaller, covered with dark coats. *Leaves* serotine, somewhat firm in texture, flat, not canaliculate, obtuse, about 20-25 cm long, 5-7 mm wide. *Scape* about 9-10 cm long. *Spathe* 1-flowered, bifid at the apex, about 3 cm long. *Flower* pink, greenish downwards, about 4-5 cm long, 3.5 cm in diameter. *Tepals* oblanceolate slightly connate at the base, the outer about 45 mm long, 6-8 mm wide, the inner nearly of the same length as the outer. *Filaments,* petalines about 25-28 mm long; anthers lunulate about 2.5-3 mm long; pollen yellow. *Ovary* obovoid, about 2.7-3.2 mm long, 2-2.5 mm wide; style about 4 cm long; stigma trifid, its lobes about 2.5 mm long.

Hab.—Among rocks or stones in the mountains of the province of Córdoba (Argentina).

Habranthus magnoii is related to *H. brachyandrus* (Bak.) Sealy, and also to *H. robustus* Sweet. The former has larger flowers with a purple base. The latter is a native of the Island of Santa Catarina (State of S. C., Brazil) and neighbouring island. Named in honor of S. Magno, painter and naturalist.

Habranthus robustus Herb. The geographical range of this species has not been cleared up till now. According to Herbert, the bulbs were found in the neighbourhoods of Buenos Aires. The only species, which for a long time made me hesitate, is the native of the province of Córdoba, which I have named *Habranthus magnoii.*

Habranthus robustus was synonymized by Traub under *H. tubispathus* (L'Hér.) Traub, but this is a smaller different species which grows really not far from Buenos Aires. On the other hand, Cabrera (see Man. Fl. Alr. Buenos Aires: 148. 1953) calls *H. robustus* another species which has about three flowers in each umbel.

Our species is frequent in the rocky hills of the island of Santa Catarina (S. C., Brazil), for example Morro das Pedras and also in the neighbouring islands. I found it cultivated at Sta. Ana (Misiones), Argentina. The mentioned region of Brazil was explored by Tweedie the Scottish collector, during the years 1824 and 1825; it is proved that several plants collected by him were erroneously assigned by authors to Buenos Aires. This is the case of *Amaryllis breviflora* (Herb.) Seub., a native of the bogs of Santa Catarina. Even if Herbert does not mention any collector, it seems to me probable that this was Tweedie, especially if we consider the real origin of the plant. This thesis appears to be confirmed by the fact that a specimen was referred by Baker to the species, with the following data: ''Buenos Aires, Tweedie!'' (see Handb. Amaryll.: 35. 1888). Owing to the fact that Tweedie was in Córdoba for the first time only in 1835, we can be sure, even without judging characters, that *Habranthus magnoii* is not *H. robustus.*

Habranthus brachyandrus (Bak.) Sealy. According to Holmberg the bulbs of his *Zephyranthes porphyrospila* were gathered during a trip to the Argentinian province of Formosa; notwithstanding, he was not sure if they were found in the province of San Luis or truly in Formosa. Fortunately, it was possible to establish from the original description (no type-material exists), that *Zephyranthes porphyrospila* Holmb. is identical with *Habranthus brachyandrus* (Bak.) Sealy. The species is found in Paraguay and the Chaco region of Argentina; it is frequent in Formosa and much cultivated in the former country and in the Argentinian province of Misiones (Oberá).

Rhodophiala bifida (Herb.) Traub, ssp. *aemantha* Rav. Hab.—Hills and fields southwards of the province of Buenos Aires.

It differs from the subspecies *bifida* by the smaller size of the plant, which has 2-3-flowered umbels and blood-coloured tepals, not pink or purple.

Eustephiopsis marginata (Pax) Fries. A species with pinkish flowers marked with yellowish and greenish inside. The leaves are almost always of a bright green or only slightly glaucescent; this point disagrees with Pax's statement. I found it in the province of La Rioja, in the mountains above Chilesito and of Famatina.

Eustephiopsis marginata (Pax) Fries, ssp. *latifolia* (Fries) Rav. It has red flowers yellowish inside; the larger leaves are grayish-glaucescent. I found a large population in the valley of Granadillas (28 km from Belén, Catamarca, Argentina), but not in flower. Flowers were found at Rumi-Rayán (Catamarca, dept. Tinogasta), a place at 2800 m of altitude; the inflorescences appeared alone, without leaves, in the hard vulcanic soil.

Hab.—Argentina from the province of Catamarca, through the mountains of Tucumán, Salta, Jujuy, to Bolivia; altitude 1800-3800 m above the sea level.

Rauhia megistophylla (Kraenzl.) Traub, Pl. Life 22: 5. 1966.—Ravenna, Sellowia 19: 33. 1967 (see also Pl. Life 24: 1969).—*Phaedranassa megistophylla* Kraenzlin, Engler Bot. Jahrb. 54, Beibl. 117: 2. 1916.—*Rauhia peruviana* Traub. Pl. Life 13: 74. 1957.

Phaedranassa megistophylla is an earlier binomial for the plant known as *Rauhia peruviana* Traub. Owing to the fact that *Rauhia* is considered as a valid genus, the specific epithet *megistophylla* is transferred. *Callithauma spathulatum* Herb. is probably referable to the same species; due to the fact that it is practically a *nomen nudum,* its use is not advisable.

During a memorable trip to the department of Amazonas (Peru), I had the unusual opportunity of observing in full flower a population of this amazing species. I found it at Pucará, near Bella Vista (Cajamarca, prov. of Jaen); this place can be considered as practically the same as the original one. I brought some of the large bulbs to Buenos Aires, but they could not stand for a long time our damp climate. However, it was possible to observe the peculiar large unusual leaves before its growth begins (in prefoliation or vernation); they are folded outwards in such manner that their margins touch.

Castellanoa marginata (Fries) Traub. A monotypic genus allied to *Chlidanthus* and *Stenomesson* (subgen. *Clinanthus*). The flowers of *Stenomesson humile* appear to be very similar to those of this genus.

In spite of the fact that *Castellanoa marginata* was already known not far from the Bolivian border, its presence was never recognized in that country. This is the first time that the genus is reported in the flora of Bolivia; this fact is supported by the existence of a dry specimen.

Hab.—High mountains of northern Argentina and the south of Bolivia; altitude, 3400-3700 m above the sea level.

Hieronymiella aurea Ravenna, Sellowia 19: 34. Oct. 1967—Syn.: *Hieronymiella tintinensis* Hunziker et Cocucci, Kurtziana 4: 7. Dec. 1967.

Bulb and *leaves* in the type-specimen absent. *Scape* cylindrical about 6-8 mm wide. *Spathe* 7-8-flowered, bivalved; valves marcescent, membranaceous, unequal, ventricose downwards, narrower upwards, the lower about 94 mm long, the upper 100-104 mm long; inner bracts much smaller, often lanceolate or filiform. *Flowers* golden yellow, pedicellate, about 62-70 mm long, nearly 44 mm or more in diameter. Pedicels about 28-45 mm long. *Ovary* oblong about 9-14 mm long, 2-3 mm wide. tepaltube nearly 19-24 mm long. *Tepals* lanceolate, the outer ones about 45-50 mm long, 12.2 mm wide, apiculate (apicula about 1.2-2 mm long; inner ones subequal or narrower, acute. *Filaments* winged, somewhat unequal, wider near the apex, tepal-textured, rather connate between them, narrower and free downwards, about 37-38 mm to the base of the anthers, then prolonged in two lanceolate lobes, longer than the anthers (about 9 mm long), for each. Anthers oblong, sessile or nearly sessile, about 3-3.2 mm long. *Style* about 67-80 mm long; stigma trifid, lobes recurved, about 1.8-2.5 mm long.

Hab. and exsiccata.—Argentina: province of Salta, Amblaio; leg. C. Spegazzini, I-1987 (type LPS 19466). Cultivated in my collection from bulbs collected in the same place of the specimen.

This is the second species of the genus. Differs from *Hieronymiella chlidanthoides* because of its yellow flowers with a shorter tepaltube.

1a. Flowers white sessile or very shorty pedicellate ....*H. chlidanthoides*
1b. Flowers yellow, distinctly pedicellated ....*H. aurea*

The genus Solaria, its presence in the flora of Argentina.

In the following lines, a new species of the genus Solaria are described. Here the genus is noted for the first time in the flora of Argentina. In addition, the chromosomes of the species are reported.

Solaria R. A. Philippi, Linnaea 29: 72. 1857.—*Symea* Baker, Saunders Ref. Bot.: tab. 260. 1871.

Flowers slightly zygomorphic, pedicellate. *Tepals* lanceolate, united near the base, greenish or purple, narrow, attenuated toward the apex, the inner somewhat shorter, often slightly cucullate at their base. *Androecium* with three fertile stamens: the upper episepal and both lateral epipetal, sometimes with three staminodes without any trace of anthers, rarely bearing only one staminode; *filaments* connate toward the base in a ring; anthers introrse in the bud, basifixed, extrorses by reflexion after dehiscence when the flower expands. *Ovary* sessile with three ovules in each cell; style elongated ± arched; stigma apical, simple. Fruiting pedicels ± reflexed, longer than the floriferous ones. Capsule globose irregular loculicidal, with few seeds. Seeds globose-angled or oblong, slightly rugose, black, with a whitish hylum. Basic number of chromosomes, $x=7$.

Plants almost always weak, with a tunicated bulb. Leaf solitary navicular. Scape cylindrical. Spathe bivalved; valves membranous.

Type-species: *Solaria miersioides* R. A. Phil.

A genus closely related to *Ancrumia* Harv., from which it differs basically by having three fertile stamens (instead of two). Two or three species from high mountains of Argentina and Chile.

Solaria attenuata Ravenna, Bol. Soc. Arg. Bot. 11: 160. 1967.

Plant about 10-14 cm high. *Bulb* oblong-conical about 3-3.5 cm long, 9-12 mm wide; external tunics whitish or ash-ochraceous. *Leaf* single, naviculate, falcate, dark green, about 20-22 cm long, 4.4-6.5 mm wide. Scape about 11 cm long. *Spathe* bivalved, many-flowered; valves narrowly lanceolate. *Flowers* greenish about 10-22 mm in diameter. *Pedicels* floriferous about 10-22 mm long. *Tepals* narrowly lanceolate, united for 1.6 mm, outer ones about 10 mm long, 2 mm wide; inner ones slightly cucullate at the base, about 6.8 mm long, 0.9 mm wide. *Filaments* complanate, connate in a ring for 0.67 mm, free part about 1.25-1.4 mm long, 1 mm wide at the base, narrower at the apex; staminode shorter, acute, or none. *Anthers* quadrate-rotundate, about 0.7 mm long. *Ovary* sessile, nearly globose or nearly ellyptical, about 1.6 mm wide; locules with three ovules; *style* often curved or declined, rarely nearly straight; *stigma* at the summit, simple. *Pedicels* fructiferous about 11-50.6 mm long, flexuose, recurved. *Capsule* nearly globose, trivalved, about 8-9 mm wide, partially covered with the remains of the perigone. *Seeds* black somewhat rugose, with a distinct whitish hylum, about 22 mm wide. Chromosomes, 2n=14.

Habitat.—Rare in the Andes of Linares, Chile, and in the province of Neuquen, Argentina; it grows on stream banks and in woods.

This species differs from *Solaria miersioides* Phil. which is very similar, on account of the absence of two staminodes; apparently also the third is also sometimes lacking. Tepals are longer and more acute (from here the specific epithet). The whole plant is somewhat more robust, especially when in fruit. *Solaria major* Reiche was described as a higher plant.

Among the material of the genus determined as *Solaria miersioides*, deposited in the Natural History Museum (BA), a single sheet from the province of Santiago (Chile) was confirmed as belonging to that species. Due to this lucky circumstance, it was possible to make comparisons and to verify that the original description is correct. Another specimen from the province of Linares, proved to be identical with the Argentinian material. On the other hand, among the places of the genus quoted by Philippi, it is also written Linares; this points suggests that Philippi had the opportunity of seeing some material of *Solaria attenuata* Rav., but apparently he did not recognize it as belonging to a different species.

Solaria attenuata appears to connect the genus with *Ancrumia* Harv. The latter is distinguishable merely because of the existence of only two fertile stamens; This point could be a difference of specific rank.

Chromosomes.—From one of the herbarium specimens in fruit cited (Boelcke 10815), a bulb already with poison applied, but still alive, was taken and planted. A short time later, appeared roots, and a leaf which was not able to develop. Root tips were cut (approximately 3 mm); they were pretreated with a saturated aqueous solution of paradiclorobenzene for 4-5 hours and then were fixed with Carnoy for 48 hours. One of the tips was washed with distilled water, then immersed in normal 2 solution of hydrochloric acid for 5-10 minutes. The next step was the squashing in an orceine drop. This technique was successful. Chromosomes were seen distinctly from the cytoplasm not excessively stained. Several cells were in an optimum stage for study. Three cells were drawn with camera lucida, but only one was selected for this work. Later permanent slides were made in the following way: freezing, detaching slide and cover-slip in absolute alcohol; previously these were smeared with Mayer's albumin.

Solaria attenuata Rav. was shown to have a chromosome complement of 2n=14, as follows: two pairs with a submetacentric centromere, two pairs with an acrocentric centromere, three pairs with subterminal centromere. In a pair of the latter group, the existence of satellite was noted.

Tristagma anemophilum Ravenna, Bol. Soc. Arg. Bot. 11: 147. 1967. Plant about 10 cm high (to the apex of leaves). *Bulb* oblong-ovoid about 12 mm. long, 7 mm wide, prolonged in a neck for 3.5-4.7 cm or more. *Leaves* 4-5 at flowering time, linear, slightly flexuose, about 5-10 cm long. 0.8-1.1 mm wide. *Scape* about 3-4 cm long, 1 mm wide. *Spathe* biflora; valves unequal, the lower about 15 mm long, the upper about 14 mm long. flowers pedicellate, whitish, cernuus, about 8-14 mm in diameter. *Pedicels* about 4.5-6 mm long. *Tepals* flattened, very narrow, nearly lanceolate, connate at the base for 2.6 mm; the outer about 11.4 mm long, 1.1 mm wide, the inner subequal. *Filaments* complanate, subulate at the apex, sepalines about 1 mm long, 0.4 mm wide at the base, petalines about 2 mm long, 0.6 mm wide at the base. *Anthers* oblong, yellow, about 0.7-0.8 mm long. *Ovary* obovoid, about 2.3 mm long, 2 mm wide; style thick, about 1.5 mm long, 0.7 mm wide, green downwards, whitish upwards; stigma capitate-trilobed.

Hab.—Argentina, Neuquén, on the mountains called Cordillera del Viento, alt. about 2200 m.

A closely related species to *T. patagonicum* (Bak.) Traub, from which it differs by the much smaller tepaltube and the very short filaments.

Tristagma nivale Poeppig. Plant about 12-22 cm high. *Bulb* ovoid-oblong about 12-32.5 mm long, 6-16 mm wide, whitish with somewhat fleshy roots; pseudoneck about 3.5-7 cm long. *Leaves* 3-6, linear, very often circinate especially toward the apex, or sometimes falcate or straight, about 8-24 cm long, 2-3.5 mm broad, somewhat obtuse at the apex. *Scape* about 5-18 cm long, 0.8-2.8 mm broad. *Spathe* 2-5-flowered; valves lanceolate about 14-23 mm long, connate for 1.6-4.2 mm at the base. *Flowers* purplish-black or greenish, cernuus. *Pedicels* about

10-35 mm long. *Tepals* united in a tube for 8.5-12.5 mm, then spreading, fleshy, blunt, about 4.7-7.5 mm long, 1-1.2 mm broad. *Filaments* nearly filiform or flattened but very narrow, the episepal group inserted at 3.5-3.7 mm from the base of the tube, about 1.2-2.5 mm long. *Anthers* erect oblong, yellow, about 1.3-1.7 mm long. *Ovary* sessile, ovoid about 2.2-3.5 mm long, 1.5-2.5 mm broad; style about 1.4 mm long; *stigma* capitate.

Hab.—Argentina, from the province of Mendoza to Tierra del Fuego, in the damp Patagonia or in the steppe; it is found also in Chile.

Variability in the flower colour and the circumstance that the leaves are not always spiraled has caused it to be classified as *T. eremophila* Speg. *Tristagma chubutense* Gandoger, poorly described, is a further synonym of the species.

Tristagma nivale Poepp., forma *australe* (Neger ex Dusen) Rav. It differs from the typical form because of its very short, nearly obsolete pedicels, and the shorter obtuse spathe-valves; no differences are found in the flower. *Tristagma inflatum* Rendle was based on a specimen with incipient fruits: during the fruiting process, the tepal-tube becomes swollen due to the growth of the ovary in the inside.

Tristagma patagonicum (Bak.) Traub. Additional synonym to be added: *Brodiaea viridior* Killip and *Tristagma viridior* (Killip) Traub.

Plant about 7-9 cm high. *Bulb* ovoid or ovoid-oblong, about 16-20 mm long, 7-9 mm wide, prolonged into a pseudoneck for 20-25 mm long. *Leaves* 1-2, linear, about 6-8 mm long, 0.7-1.8 mm broad, with a blunt apex. *Scape* weak, about 4.5-8 mm long, 0.8-1.1 mm broad. *Spathe* bivalved one-flowered; valves whitish, somewhat striated, lanceolate, about 19 mm long, 2.2-2.8 mm broad, connate for 2.2 mm toward the base. Flower pedicellate, erect, white, with a brown or greenish-brown streak on the outside of tepals, about 12 mm long, 20-35 mm in diameter. *Tepals* united for 11-20 mm, then spreading, the outer about 10-14.5 mm long, 2-6.4 mm broad, the inner about 8.5-10 mm long, 2-5.8 mm broad, both series blunt or more often acute. *Filaments* very narrow, the episepal group attached at 3.3-5.3 mm from the base of the tepal-tube, about 3-4.8 mm long, the epipetal group attached at 5.5-6.5 mm from the base of the tepaltube, about 3.5-5.5. *Anthers* oblong, obliques, yellow, about 1.1 mm long. *Ovary* oblong, about 2.6-3 mm long, 0.9-1.5 mm wide. *Style* filiform, about 5.5-7.7 mm long; stigma capitate-trilobed.

The name *Brodiaea luzula* was proposed by Macloskie in order to replace *Luzula patagonica* Speg. *(Juncaceae)*. This was due to a mistake of Spegazzini. In fact, when this author made the combination *Triteleia patagonica* (Speg.) Speg., he assigned erroneously the type to the sheet 366 (instead of the correct 362). The new name of Macloskie, was on account of Baker's earlier homonym in the same genus. Actually the number 366 was the type of the above mentioned *Luzula patagonica* (see Hauman 1917), a genuine member of the Rush Family. Spegazzini had never had the intention of transferring it to the genus *Triteleia (Liliaceae)*. Therefore, *Brodiaea luzula* Macloskie (and its further combinations in other genera), must be considered as an absolute synonym of *Luzula patagonica* Speg., and not as was interpreted by Traub (1955), as belonging to the member of the *Liliaceae* mentioned. Incidentally, *Brodiaea patagonica* Bak., and *B. patagonica* Speg. are the same species; as a result, the further name given by Macloskie for the latter appears as superfluous.

Tristagma circinatum (Sandw.) Traub. and *T. viridior* (Killip) Traub, correspond to the very same species. Concerning the size of its flowers and tepals, *Tristagma patagonicum* is quite variable.

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THE BERING LAND BRIDGE, edited by David M. Hopkins. Stanford University Press, Stanford, California. 1967. 495 pp. Illus. $18.50. The history of Beringia, defined to include Western Alaska, Northeastern Siberia, and the shallow portions of the Bering and Chuckchi Seas, has from the beginning of the 20th century fascinated geologists, biogeographers, anthropologists, paleobotanists, mammalogists, and many others. There is good reason for the intense multidisciplinary and international interest in this strategic area of the earth's surface. It was over this narrow land bridge, joining Asia and North America, that numerous land plants, along with the horse, bison, mammoth, and many other animals including man himself, made their way into the New World. The Beringia land bridge was not a one-way street. Newly evolved species of land plants were exchanged between continents as readily as land mammal populations during Tertiary time.

This book of nearly 500 pages originated as a Symposium with the title, "Late Cenozoic History and Environments of the Bering Land Bridge", held at Boulder, Colorado, in August, 1965. The book is edited by the organizer of the Symposium, Dr. David M. Hopkins, Research Geologist with the Geological Survey. Dr. Hopkins has written the Introduction, and a concluding chapter with the significant title, "The Cenozoic history of Beringia—A Synthesis." This chapter attempts to condense the diverse subject matter of the Symposium into a meaningful summary. As a layman in such matters, I judge Dr. Hopkins efforts to be highly successful. In his role as Editor, Dr. Hopkins must have exerted a strong editorial hand. The subject matter of the Symposium is drawn tightly together, compared with other Symposia published in book form. In all, there are 24 chapters and 27 contributors, 9 of them Russian. Incidentally, the Russian contributions have been translated into English.

To one not knowledgeable about the complex geological history of the area, it comes as a surprise to learn that the Beringia land bridge was established and receded several times during the course of geological time. For instance, Beringia lay above sea level during most of the early and middle Tertiary. During this period it was part of a series of floral provinces that extended far to the south on both shores of the Pacific. During the Quaternary, which began about 3 million years ago, there were several fluctuations in sea level, alternately severing and reestablishing the land bridge. Even more surprising, a rapid rise in sea level drowned the Bering Land Bridge for the last time as late as 10,000 years ago.

For those persons with botanical training and interest, there are four chapters that deal with several aspects of the vegetational history of the area during the Quaternary, and one chapter that traces the history of the Okhotsk and Bering Seas by means of the diatom floras. Plant scientists with an interest in systematics and the processes of organic evolution will find much that is new and stimulating in the chapter by A. W. Johnson and A. G. Packer on "Distribution, Ecology and Cytology of the Ogotoruk Creek Flora."

Johnson and Packer have made skillful use of cytological data to supplement distributional and fossil information. They conclude that the Ogotoruk Creek-Cape Thompson flora consists of four major geographical elements; (1) an oceanic element, widespread along northern strands; (2) an arctic element that evolved in the mountainous regions to the south, in North America or Eurasia; (3) an arctic element that evolved and remained **in situ;** and (4) a boreal element that is primarily associated with the boreal forest.

In discussing the four elements in this flora, Johnson and Packer make the significant statement that, "On the basis of the polyploid spectrum within each of these elements, it appears that the oceanic and montane elements, both high in diploids, have evolved under relatively stable conditions, whereas the high frequency of polyploid species in the arctic and boreal elements suggests conditions of relative instability favoring the survival of newly formed polyploid species."

This review cannot do justice to the merits of the book. The two chapters on man will be of special interest to all biologists; one by Hansjürgen Müller-Beck of the University of Freiburg (On Migrations of Hunters across the Bering Land Bridge in the Upper Pleistocene), and the other by W. S. Laughlin of the University of Wisconsin (Human Migration and Permanent Occupation in the Bering Sea Area).

The book is attractively printed and bound for which we can thank the Stanford University Press. There is a General Index and an Index to Faunal and Floral Taxa. Regrettably the book is so expensive ($18.50) it will probably not be purchased by those for whom it would be most useful.—**Thomas W. Whitaker**

GENETICS OF FUNGI, by Karl Esser and Rudolf Kuenen. Springer Verlag, New York. 1967. Pp. 500. $18.50. "Genetics of Fungi" by Karl Esser and Rudolf Kuenen is a typical example of German scholarship; thorough, meticulous, detailed, and comprehensive. The authors are well qualified for the task of summarizing and interpreting the results of genetic research with fungi. Each has been a steady contributor to an understanding of hereditary mechanisms in **Podospora anserina**, an organism infrequently used by American and English investigators.

"Genetics of Fungi" comprises about 500 pages, organized into seven chapters which follow each other in logical sequence. They are: Morphology, Reproduction, Replication, Recombination, Mutation, Function, and Extrachromosomal Inheritance. One of the short chapters has a terminal Summary, but for the remainder, every topic within a chapter is summarized when the discussion is completed. Each chapter ends with a list of Literature Cited which for some chapters runs to as much as 21 pages and 550 titles. A supplement has been added to the literature list of each chapter after the German manuscript was completed. This device is an obvious attempt to make the text current in this fast moving field of investigation where much work is out-of-date before it reaches the press. The supplement updates the literature through 1966.

This book will no doubt have permanent value as a reference work. Graduate students with a primary interest in fungi, and senior investigators of problems concerned with fungal genetics will have constant need for the book, if for no other reason than as a handy source of pertinent literature for their investigations. I should make haste to add that the book is no annotated bibliography, but attempts the difficult assignment of explanation, interpretation and synthesis. The authors must be given good marks for achieving in a large part their major objectives.

While they usually define the technical terms peculiar to fungal morphology and genetics when first used, in my opinion it would have improved the book for use as a reference tool if these definitions were gathered together in a Glossary. Also, I find it strange that the genetics of plant pathogenic fungi go practically unmentioned. For example, the elegant experimental work of H. H. Flor with flax rust certainly deserves a prominent place in a reference book on fungal genetics, but this fundamental work is not even cited.

Fungal geneticists will applaud Prof. Erich Steiner of the University of Michigan for a first rate translation. It indeed must have been a labor of love. Translating a technical reference work of this magnitude is something that is not lightly undertaken, and cannot be done in spare time between classes, or riding to and from the laboratory on bus or subway.

The book has a short Appendix, an Author and a Subject Index. It is pleasantly written and copiously illustrated. Investigators and students with an interest in fungal genetics are now served by two excellent texts that complement each other to a considerable degree; the one under review, and Fincham and Day's "Fungal Genetics." The "Genetics of Fungi" is priced at $18.50, which at first glance seems excessive, but is nevertheless reasonable for a book of this nature.—**Thomas W. Whitaker**

PHYLO-GENETIC SYSTEMATICS, by Willi Hennig; translated by D. Dwight Davis and Ranier Zangerl. University of Illinois Press, Urbana, Ill. 1966. Pp. 362. Illus. $12.50. Hennig's 1950 work on phylo-genetic systematics had been available only in the German Language and thus had not been adequately considered by others in the continuing synthesis of bioevolutionary theory as applied to systematic biology. Therefore, we are greatly indebted to Drs. Davis and Zangerl, and the University of Illinois Press, for this translation of the completely revised edition of Hennig's text, and which makes it available to students of biosystematics. Although the book is difficult to read, the extra effort required is well worth the stimulation received in learning about Hennig's outlook on biosystematics. He is uncompromisingly in favor of a system of phylogenetic classification. The book is divided into four sections: (1) the position of systematics among the biological sciences; (2) tasks and methods of taxonomy, (3) problems, tasks and methods of phylogenetics, and (4) concluding remarks. This is required reading for all interested in biosystematics.

PLANTS, MAN AND LIFE, by Edgar Anderson. University of California Press, Berkeley, Calif. 94720. 1967. Pp. ix + 251. Illus. This revised edition of a stimulating book by an outstanding authority on "man's influence on plant life, particularly crop plants" will be welcomed by all. The topics covered include: man and his transported landscape, history of weeds; the greater paradox (inadequate study of cultivated plants and weeds by botanists); the clue from the root-tips—caryology and genetics; the clue from diversity—variation under cultivation; how to measure an avocado; budgets vs. scholarship; uneconomic botany; dung heaps and the origin of agriculture; our most important crop plants and their probable origin; sunflowers, the one native American crop; and adventures in chaos—need of application of the taxonomic method to cultivated plants. This outstanding book in its field is highly recommended to amateur and professional plant scientists.

INTROGRESSIVE HYBRIDIZATION, by Edgar Anderson. Facsimile of the 1949 Edition. Hafner Publ. Co., 31 E. 10th St., New York, N. Y. 10003. 1968. Pp. ix + 109. Illus. $5.50. The reprinting of this stimulating book on introgressive hybridization, the repeated back-crossing of hybrids to one or both parents, by an outstanding authority, will be welcomed. It is concerned with such hybridization in the field under natural conditions, particularly with how the effects of hybridization can best be measured in natural populations. Highly recommended to all plant scientists.

AMERICAN BOTANY, 1873-1892, by Andrew Denny Rogers III. Facsimile of the 1944 Edition. Hafner Publ. Co., 31 E. 10th St., New York, N. Y. 10003. 1968. Pp. 340. Illus. $8.75. Subtitled, "Decades of Transition", this book provides an historical perspective for an important period in the development of American Botany. The account begins with the work of Asa Gray; and then follows consideration of Government surveys and explorations, including paleobotany, and explorations in North America; morphology; paleobotany and the coal floras; Englemann's work; agricultural experimentation, the Greene-Gray controversy; Mexican, Central, and South American explorations; Gray's last years, and the beginning of the new era in North American botany. Required reading for all interested in plant science.

ARBUSTUM AMERICANUM, by Humphrey Marshall. Facsimile of the 1785 Edition; and CATALOGUE ALPHABETIQUE DES ARBRES ET ARBRISSEAUX, by Humphrey Marshall (French translation). Facsimile of the 1788 Edition. Hafner Publ. Co., 31 E. 10th St., New York, N. Y. 10003. 1968. Pp. xii + 174; xxiii + 278. Illus. $20.00. This is the first book on American trees—"the American Grove"—published in the colonies. The facsimile edition of the English text and the translation into French are preceded by an introduction by Joseph Ewan. The text was written by the nurseryman, Humphrey Marshall, who established the second botanic garden in the colonies. This is an important work since many tree species were described in it for the first time, based on living plants. Up to now, the work has only been known as a rare book, and we are indebted to Dr. Ewan and the Hafner Publ. Co., for this fine facsimile reprint which makes it available to all plant scientists. It is highly recommended to all interested in plant science.

FLORULA LUDOVICIANA, by C. S. Rafinesque. Facsimile of the 1817 edition, with an introduction by Joseph Ewan. Hafner Publ. Co., 31 E. 10th St., New York, N. Y. 10003. 1968. Pp. xl + 178. $12.50. The controversial book is subtitled, "A Flora of the State of Louisiana; translated, revised, and improved from the French of C. C. Robin". It was composed by the eccentric Rafinesque, who never visited the State and "who rashly equated the running text of C. C. Robin's catalog into a systematic account." Effectively suppressed by Asa Gray and his colleagues, this book was almost unknown to plant scientists. Now, thanks to Dr. Ewan, who has contributed an adequate introduction, and the Hafner Publ. Co., who produced this fine facsimile edition, it is now made available to all students of systematic biology for critical study.

THALASSIOPHYTA AND THE SUBAERIAL TRANSMIGRATION, by A. H. Church. Facsimile of the 1919 Edition. Hafner Publ. Co., 31 E. 10th St., New York, N. Y. 10003. 1968. Pp. 95. Illus. $4.00. This reprint of Church's stimulating views on the evolution of land plants will be welcomed by the new generation of plant scientists who have not had the opportunity of obtaining the original edition. Highly recommended to all interested in evolutionary biology.

ON THE INTERPRETATION OF PHENOMENA OF PHYLLOTAXIS, by A. H. Church. Facsimile of the 1920 Edition. Hafner Publ. Co., 31 E. 10th St., New York, N. Y. 10003. 1968. Pp. 58 + 16. Illus. $3.50. This facsimile of the 1920 edition will be welcome since it has long been out of print. In it the essential theory behind phyllotaxis is explained according to Church. It deals with the causes of leaf origin, the meaning of the term, "leaf"—extension of a plant soma, its phylogeny and secondary adaptation. Highly recommended to all plant scientists.

SWARTZIA (LEGUMINOSAE, CASEALPINIOIDEAE, SWARTZIEAE), by Richard S. Cowan. Monograph No. 1. Flora Neotropica. Hafner Publ. Co., 31 E. 10th St., New York, N. Y. 10003. 1968. Pp. 228. Illus. This represents a thorough study of the American species of the genus **Swartzia**, with 127 species in Tropical America. After a brief consideration of the history of the genus, the morphology, phylogeny and distribution, generic diagnosis, and keys to subgeneric groups and species, the individual species are described in detail. Highly recommended to all interested in the flora of Tropical America.

PLANT PROPAGATION, by Hudson T. Hartmenn and Dale E. Kester. 2nd Edition. Prentice-Hall, Inc., Englewood Cliffs, N. J. 07632. 1968. Pp. x + 702. Illus. $14.00. Subtitled, "Principles and Practices", this second edition, revised and un-dated encyclopedic work on plant propagation for amateur and professional horticulturists will be welcomed. The five sections are devoted to general aspects of propagation; sexual and asexual reproduction; special methods of propagation; and propagation of selected plants. Although the coverage is wide, the extensive literature on bulb-cuttage (for survey see Traub—"The Amaryllis Manual, 1958; Herbertia 1934-1949) is omitted. Such minor defects can easily be remedied, and this outstanding cyclopedia on plant propagation is highly recommended to all horticulturists.

PLANT PATENTS; WITH COMMON NAMES, 1967 SUPPLEMENT, 2699 THROUGH 2783. Publ. by the American Association of Nurserymen, 835 Southern Bldg., Washington, D. C. 20005. 1968. Pp. 7. $0.50. This is a supplement to the listings of plant patents granted in 1967. The subject matter is arranged under three parts: I. Numerical Listings, II. Alphabetical Listings under common names, and III. Alphabetical Listing of names and addresses of originators or discoverers and assignees.

MANUAL OF WAYSIDE PLANTS OF HAWAII, by Willis T. Pope. Charles E. Tuttle Co., Rutland, Vt. 05701. 1968. Pp. 289. Illus. $6.00. Most of the Hawaiian "wayside plants" have been introduced from other regions. These include "smaller plants that may ordinarily gain attention in the fields, waste-lands and along road-sides . . . which persist without intentional human assistance." These are considered under the color of flower key; poisonous and medicinal plants; weeds and their control, and an extensive descriptive catalog of plants with illustrations arranged under plant families. Recommended to all who are interested in the flora of Hawaii.

POISONOUS PLANTS OF HAWAII, by Harry L. Arnold. Charles E. Tuttle Co., Rutland, Vt. 1968. Pp. 69. Illus. $2.50. Most of the more than 90 poisonous plants of Hawaii discussed in this book have been introduced from other regions. First the common and dangerous plants of Hawaii are grouped on the basis of allergic reactions, and mushroom-like fungi. This is followed by a detailed catalog of poisonous plants with illustrations. Recommended to all residents of, and visitors to, the Hawaiian Islands, and to students of poisonous plants.

HAWAIIAN FLOWERS & FLOWERING TREES, by Loraine E. Kuck and Richard C. Tongg. Charles E. Tuttle Co., Rutland, Vt. 05701. Popular edition, 7th printing 1967. Pp. vii + 158. Illus. $2.95. Subtitled "A Guide to Tropical & Semi-tropical Flora", this attractive book will be welcomed. The many flowering herbs and trees that appear in the Hawaiian floral pageant have been introduced from various regions of the world, and these are profusely illustrated in color in the descriptive catalog. In each case the common and scientific names, place of origin, plant description, notes on habitat, flowering season, and other details of interest are given. Highly recommended to all interested in the flora of Hawaii.

MORPHOGENESIS IN PLANTS, by C. W. Wardlaw. Barnes & Noble, 105 5th Ave., New York, N. Y. 10003. 1968. Pp. 451. Illus. $14.50. Subtitled "A Contemporary Study", this new enlarged and completely revised version of the 1952 edition, by the outstanding authority in this field, will be welcomed. It incorporates the notable contributions made in plant morphology since 1952, and emphasizes the integrated unity of the individual organism. This sets it apart from other texts. This is required reading for all interested in plant science.

PLANT VIRUSES, 4th Edition, by Kenneth M. Smith. Barnes & Noble, 105 5th Ave., New York, N. Y. 10003. 1968. Pp. ix + 166. Illus. $5.00. This completely rewritten, and expanded new 4th edition of an outstanding text fills a definite need. After characterizing viruses, chapters are devoted to symptomology of virus-infected plants; physiology of plant virus diseases; isolation of plant viruses; morphology and ultrastructure and chemistry of viruses; transmission by vectors and other than vectors; quantitative assay and serology of plant viruses; tissue- and cell-culture of plant viruses; indicator plants; and nomenclature and classification. The subject is presented in a concise and easily readable manner, and is highly recommended to all interested in plant viruses.

ESSAYS ON FORM IN PLANTS, by C. W. Wardlaw. Barnes & Noble, 105 5th Ave., New York, N. Y. 10003. 1968. Pp. xiv + 399. Illus. $8.75.

This volume includes various essays published previously by the author on the subject of form in plants. In Part 1, the history of plant morphology is detailed, including the author's outlook on the subject. Part 2 is concerned with discussions on the unification of botanical science; and Part 3, is devoted to perspectives in morphogenesis. These stimulating essays are highly recommended to all interested in plant science.

SUPPLEMENT (1961—1965); CHECK LIST OF PLANT AND SOIL NEMATODES, by Armen C. Tarjan. University of Florida Press, 15 N.W. 15th St., Gainesville, Fla. 1967. Pp. xiii + 115. $6.00. This book supplements the original "Check List of Plant and Soil Nematodes" (1960), and brings the subject up-to-date, from 1961 through 1965. The changes and additions to species names validly proposed under the Int. Rules of Zoological Nomenclature are listed chronologically. This book is indispensable to all interested in nematology.

THE PRESERVATION OF NATURAL HISTORY SPECIMENS, edited by Reginald Wagstaffe and J. H. Fidler. Volume II. 1968. Philosophical Library, 15 E. 40th St., New York, N. Y. 10016. 1968. Illus. Pp. xv + 404. $17.50. This work includes sections on the preservation of fishes, amphibians, reptiles, birds and mammals as well as botanical and geological material. In addition, special sections deal with casting reptiles, amphibians, whales, and the modeling and casting of relief maps. Vol. I (Part 1), previously published, covers the invertebrates. Vol. II, under review here, is in three parts: Part 2. Zoology, vertebrates; Part 3, Botany and Part 3, Geology. This is a required reference work for all naturalists, professional and amateur.

PAPERS ON PLANT SYSTEMATICS, edited by Robert Ornduff. Little, Brown & Co., 34 Beacon St., Boston, Mass. 02106. 1967. Pp. x + 429. Illus. paper cover, $6.00. The editor is to be congratulated on a happy choice of research papers pertinent to plant systematics. About half of these papers have appeared since 1960, and all but four were published since 1950. They are grouped under I, anatomy and morphology; II, cytology, embryology and genetics, III, biochemical systematics, and IV, field and garden studies. Indispensable for all interested in plant systematics.

PAPERS ON PLANT GROWTH AND DEVELOPMENT, edited by W. M. Laetsch & R. E. Cleland. Little, Brown & Co., 34 Beacon St., Boston, Mass. 02106. 1967. Pp. x + 479. Illus. $6.00. The reprinting of these research papers by outstanding authorities is timely, in response to the attention being given to developmental problems in plant physiology. The papers are grouped under: I, natural plant growth regulators; II, control of growth in intact systems by growth regulators; III, correlative control of growth; IV, role of light in plant growth; V, control of growth in isolated organs; VI, control of differentiation; VII, experimental control of form, and VIII, mechanism of growth regulator action. Highly recommended to all interested in plant physiology.

CELL FUNCTION, by L. L. Langley. 2nd Edition. Reinhold Book Corp., 430 Park Ave., N. Y. 10022. 1968. Pp. xiii + 364. Illus. $10.00. This thoroughly revised edition of an outstanding text on intracellular activities will be welcomed. The topics discussed include size and organization of the cell; biostatistics; gas laws, the liquid state and solution; electricity; methodology; protoplasm and cell membrane; metabolism, basic principles and reactions; mitochrondria; lysosomes; electrical activity; movement, reproduction; growth and decline. Highly recommended to all interested in physiology.

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1. AMARYLLIDACEAE: TRIBE AMARYLLEAE, by Traub & Moldenke (including the genera Amaryllis, Lycoris, Worsleya, Lepidopharynx, Placea, Griffinia, and Ungernia; Manila covers; 194 pages, incl. 18 illustrations. $5.00 postpaid.

This is required reading for every amaryllid enthusiast.

2. DESCRIPTIVE CATALOG OF HEMEROCALLIS CLONES, 1893—1948, by Norton, Stuntz, and Ballard. A total of 2695 Hemerocallis clones are included and also an interesting foreword, and explanatory section about naming daylilies. Manila covers; 100 pages (1—X; 1—90), includes a portrait of George Yeld. $5.00 postpaid.

3. THE GENERA OF AMARYLLIDACEAE, by Hamilton P. Traub. Includes a general introduction, a key to the subfamilies, infrafamilies, tribes, subtribes and genera of the Amaryllidaceae, and descriptions of all the genera. Every member of the Society should have this book for constant reference. Manila covers; publ. 1963; 85 pages. $5.00 postpaid.

4. LINEAGICS, by Hamilton P. Traub. This is the first outline text for the undergraduate student on the grouping of organisms into lineages. The text is divided into four parts: (a) the history of lineagics and lineagics as an integrated science; (b) basic lineagics, principles and procedures; (c) applied lineagics, principles and procedures; and (d) research methods in lineagics. Recommended for the student in biology. Publ. 1964. Manila covers, 163 pages, incl. 8 illus. $5.00 postpaid.

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1970

EDITED BY

HAMILTON P. TRAUB

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1970

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PLANT LIFE, VOL. 26, NO. 1, January, 1970

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India—Mr. Sydney Percy-Lancaster, **Lucknow**
South Africa—Mr. Leon Boshoff-Mostert, **Balfour**
Argentina—Prof. Pedro F. Ravenna, **Buenos Aires**

[THE AMERICAN AMARYLLIS SOCIETY—continued on page 191.]

PREFACE

We are indebted to Prof. Penrith B. Goff of Wayne State University, Detroit, Michigan, for the cover design which is based on a drawing made by Thad M. Howard of a dwarf *Sprekelia* species which he collected in the Mexican States of Puebla and Oaxaca.

This 37th issue of the AMARYLLIS YEAR BOOK is dedicated to Dr. Thaddeus Monroe Howard, Jr. (known to the members as Dr. Thad M. Howard), who received the WILLIAM HERBERT MEDAL for 1970 in recognition of his outstanding contributions to the advancement of the amaryllids. Our knowledge of the Alliums of Mexico had languished for more than a century and a half. All Alliums collected in Mexico had been thrown together under two species names—*Allium glandulosom* and *A. scaposum.* And this condition might have continued for another century and a half, or even longer, but for the determined industry of Dr. Howard in collecting all of the Mexican and Guatemalan Alliums that he encountered on his collecting trips since 1953. On the basis of the Alliums that he collected it was possible to clear up to a considerable extent the problems connected with the Alliums of Mexico and Guatemala when these living plants were placed in the hands of your editor beginning in 1967 (see Plant Life *23*: 88-95.; 110. 1967; *24*: 127-163. 1968). This points up the need for the intelligent plant collector in our day, and Dr. Howard has undoubtedly earned the recognition that goes with the 1970 Herbert Medal Award. But this is not all. He has also been active in collecting numerous species in the genera *Zephyranthes, Habranthus, Sprekelia, Hymenocallis;* and members of the genera of the tribe *Milleae.* This again represents a sufficient contribution for the Medal Award. Thus, the honor is doubly deserved.

In this issue, Dr. Howard begins in part an article on his plant collecting activities. J. L. Doran writes about his plant collecting trips to South America since 1964, and Dr. Ruppel contributes notes on his 1969 collecting journeys in Argentina.

Mr. Williams writes about the aquatic *Amaryllis* collected by Dr. Ruppel, Harry Blossfeld describes in detail two Brasilian *Amaryllis* species and Prof. Ravenna contributes a valuable article on *Amaryllis, Rhodophiala* and *Habranthus* species.

Mr. Fesmire writes on the breeding of a miniature *Amaryllis;* and Messrs. Buchmann and Mertzweiller continue their reports on *Amaryllis* breeding.

U. C. Pradhan reports on an apparent cross of *Sprekelia* and *Amaryllis,* and Henry van Woesik writes on induced mutations with reference to *Amaryllis* breeding. L. S. Hannibal discusses Crinums.

Albert P. Lorz reports on outdoor production of Amaryllis seedlings, and W. J. Perrin details the *Amaryllis* cycle. Mr. Manning writes about the induction of polyploidy in *Amaryllis.* Prof. Adee discusses *Amaryllis* culture, and the first year hobby greenhouse. Hugh L. Bush writes about his experiences with amaryllids, and Dr. Ruppel reports

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on the propagation of *Hymenocallis.* Alek Korsakoff writes on *Eurycles amboinensis,* and Mr. Buck on Daylilies. Mrs. Tebben reports on the Florida Amaryllid season, and Mr. Goedert on the 1969 *Amaryllis* Season. Dr. Artjushenko contributes a monographic treatment of the genus *Ungernia.*

Mrs. Pickard writes on the guide lines for official Amaryllis shows. There are reports on the 1969 Amaryllis shows, and other contributions as shown by the table of contents.

Contributors to the 1971 issue of the AMARYLLIS YEAR BOOK are requested to send in their articles by August 1, 1970, in order to insure earlier publication of this edition. Unless articles are received on time, publication will again be delayed to June or July or even later as with some issues in the past. Your cooperation toward earlier publication will be greatly appreciated. Those having color slides or transparencies which they wish to use as the basis of illustrations, are requested to have black-and-white prints made, and to submit these with their articles.

December 15, 1969
2678 Prestwick Court,
La Jolla, California 92037

Hamilton P. Traub
Harold N. Moldenke

PLANT LIFE LIBRARY—continued from page 190.

I do not mean to suggest that Dr. Gottleib's text is tailored for a spoon fed audience; quite the contrary, the motivated student has every opportunity to exert his intellectual prowess. Mastery of botanical principles is not easy to come by without serious study and "Plants" should do much to stimulate such study. At the college level this book should find favor as supplemental or assigned reading for beginning courses in plant science. It could probably be used as the main text for certain segments of beginning courses in biology.

The diagrams are good, but the photographs of plants, and plant parts are not sharply reproduced by the offset printing process. Frequently, the reproduction of the photographs is not sufficiently clear to depict the author's intentions. There is a Bibliography of 25 titles, mostly general works. A useful index of four pages terminates the book. For anyone wishing to improve his knowledge of the plant kingdom this small, compact book can be highly recommended.—**Thomas W. Whitaker**

THE EVOLUTION AND CLASSIFICATION OF FLOWERING PLANTS, by Arthur Cronquist. Houghton Mifflin Company, Boston. 1968. 396 pp. $6.95. This book is clear proof if any is needed that Dr. Arthur Cronquist, of the New York Botanical Garden, is a prodigious and prolific investigator, with a sharp and effective pen. Cronquist has a gift for the apt, pointed phrase and earthy expression. As author-scholar, he has not only mastered information from the traditional disciplines that support taxonomy such as paleobotany, morphology, histology, and anatomy, but he has screened and used significant data from genetics, cytology, biochemistry, statistics and serology. It is too early to assess the impact of this book on plant taxonomy, but this reviewer predicts it will be considerable. This does not mean that "The Evolution and Classification of Flowering Plants" is the gospel for plant classification and evolution, but surely Cronquist has provided a framework for a modern, and a much needed revision of the classification of flowering plants.

The book must be judged primarily upon the author's treatment of the first three chapters where he discusses Taxonomic Principles (Chapter 1); The Origin of the Angiosperms (Chapter 2); and The Evolution of Characters (Chapter 3). These three chapters provide Cronquist with an opportunity to present the factual and expound the philosophic basis for his classification. The remaining two chapters are essentially lists with the evidence for the arrangement of the various taxa within the system (Chapter 4, The Subclasses, Orders, and Families of Dicotyledons; and Chapter 5, The Subclasses, Orders, and Families of Monocotyledons).

Cronquist is not timid about expressing his personal opinions, and he plunges into a number of controversial thickets with abandon. In fairness, however, his position on most matters remains flexible, as he admits his judgment might be biased, or new evidence could overturn his present viewpoint.

This reviewer has neither the expertise nor the space to discuss the many features of this book, but one comment is in order. It is clear that Cronquist takes a dim view of selection as a motivating force in the evolution of the higher taxa of flowering plants. He cites many instances where it is difficult to demonstrate that one character has selective advantage over another. As Cronquist points out strict selectionists would argue that the advantage is there, but is obscured or difficult to uncover or interpret.

The book concludes with a "List of Classes, Subclasses, Orders, and Families of Magnoliophyta"; a useful Glossary of about eight pages; and an Index.—**Thomas W. Whitaker**

ANYONE CAN HAVE A GREEN THUMB, by Alice de Wolf Pardee. Hearthside Press, 381 Park Av. So., New York, N. Y. 10016. 1968. Pp. 126. Illus. $4.95. The author presents a ten-point gardening program, and proceeds to elaborate on these, including discussion of garden design; knowledge about plants; tools; maintenance; insect control; rocky, shady and seaside gardens; growing plants indoors; and favorite plants. Recommended to all beginning gardeners.

FLORAL ART FOR RELIGIOUS EVENTS, by Leon J. Tolle, Jr. Hearthside Press, 381 Park Av. So., New York, N.Y. 10016. 1969. Pp. 192. Illus. $8.95. This guide to religious floral customs is in addition a cyclopedia of the art, architecture, holy-day observances, liturgies, symbols and traditions of the major faiths practiced in America. The subject matter is grouped in two parts: (1) The religious background—setting, custom, calendar and ritual; and (2) the florist's workbook. Very highly recommended.

NEW STRUCTURES IN FLOWER ARRANGEMENT, by Frances Bode. Hearthside Press, 381 Park Av. So., New York, N. Y. 10016. 1968. Pp. 128. Illus. $5.95. This profusely illustrated up-to-date book on flower arrangement will be welcomed by the student of modern design in this field, the flower show exhibitor or judge, home decorator or hobbyist. The subject matter includes (1) assemblages, collages, constructions, combines, mobiles, stabiles, stambiles, and maxim-art, and (2) New look in plant materials; new ways with dried materials; shells, driftwood, etc.; mixing crafts; background in a new focus; and the newest developments. This book is indispensable to all interested in the newest developments in flower arranging.

DO'S AND DON'TS OF HOME LANDSCAPE DESIGN, by Robert J. Stoffel. Hearthside Press, 381 Park Av. So., New York, N. Y. 10016. 1968. Pp. 192. Illus. $6.95. This non-technical guide to landscape design for the beginner includes chapters on planning for beauty and use; the house approach; the family living area; special gardens; service and utility areas; lawns and ground covers; maintenance; garden design; lighting the landscape, and plants for the landscape. Highly recommended to all interested in landscape design.

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HERBERT MEDALIST—THADDEUS MONROE HOWARD, JR.,
JULY 1969

THADDEUS MONROE HOWARD, JR.

AN AUTOBIOGRAPHY

A person's life is often shaped by the tiny twists and turns of fate and by the influences of those surrounding him. Certainly much of my life has been the result of such tiny unexpected twists and turns, and has indeed been influenced by other people. I have often wondered what it might have been like, under another set of circumstances, and with another set of acquaintances. To think that I can reflect on such seemingly unimportant incidents as drawing a picture of a bird in a Vacation-Bible school class, finding a *Canna* root in a vacant lot, tossed over someone's back fence, etc. as spurring my interest in zoology and botany never ceases to amaze me.

CHILDHOOD AND YOUTH, 1929-1947

The year 1929 was the year of the Crash, and investors reacted by jumping out of windows of tall buildings. That same year I also ''crashed'' into the scene, but my parents, Thaddeus Monroe, Sr., and Lolita Guerrero Howard, had no tall buildings from which to jump as the result of their little ''investment''. I was too late for Christmas, and too early for New Year's eve, being born December 28, 1929 in San Antonio, Texas. I got to celebrate many a yuletide season in the years that followed, but birthday presents seem out of place three days after Christmas.

At the age of six, I was given the task of tracing a bird from a bird book in vacation Bible school, and thus my first real interest in ornithology was born. My interest in bird-life expanded to mammalian life as well, and as a growing child I had many wild mammal and bird pets. This was ultimately to help me choose Veterinary Medicine as a profession. My interest in plants came about quite unexpectedly, when I found some discarded *Canna* roots while playing with companions in a vacant lot. These, along with some *Iris* rhizomes were retrieved from the discards in the heap and proudly taken home to be planted as ''bulbs''. The Iris did not make too much of an impression, but the cannas did. This was a tall purple-bronze leafed species with small orange-red flowers and thick purplish-red rhizomes. I still have a souvenir of this original plant, now some 28 years later. Thus I began formally ''collecting'' my first ''bulbs'', even before I began gardening (by a few minutes) at the age of twelve. My interest remained linked to only those things that were lily-like and bulbous rooted. I managed to beg my parents for enough money to buy my first book on bulbous plants, ''Garden Bulbs in Color'', MacFarland, which became my ''Bible'' for awhile, until I sent off for catalogs advertised in garden magazines. My interest received its first important stimulus with the

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arrival of a catalog from Oakhurst Gardens which listed ''out-of-the-ordinary bulbs'' uniquely described and well illustrated by its proprietor, James N. Giridlian. Another little ''classic'' from Cecil Houdyshel, and one from Carl Purdy, helped round out my list of informative bulb catalogs. I was deeply impressed with these three men, each of whom helped to contribute much to the bulb-gardening world. It struck me that Mr. Purdy had become famous by popularizing the native wild flowers of the Pacific coastal states, and that his name was synonymous with bulbs such as *Calochortus, Brodiaea, Fritillaria, Camassia, Erythronium,* and the like. My Texas pride was piqued. Surely we must have many species of bulbous plants within the borders of the Lone Star State that are equally worthy of gardens as those on the West Coast. I toyed with the idea of collecting and popularizing our own native Texas species, so that perhaps I might someday be a sort of poor-man's ''Carl Purdy'' of Texas. At age 16 this did not seem at all vainglorious, so I determined that I would do this. I had already begun collecting a few of the local natives, such as *Habranthus texanus, Nothoscordum bivalve, Allium drummondii, Cooperia drummondii,* and *C. pedunculata* and *Nemastylis geminiflora.*

In high school, I had joined the Brackenridge High Garden Club, a small and rather dreary little club, that to me had little purpose for being, and few members. I found that it was difficult to find many students who would be interested in joining any club known only as THE ''Garden Club''. No teen age appeal. Why not, I suggested, change its name to something that really ''swings'', such as ''The Campus Dirt Dobbers''? The members and sponsor enthusiastically voted to change the name unanimously, and thus the C.D.D.'s were born. The transformation was amazing. We began raising money with school plant sales, and the rest of the large student body (nearly 2000) became aware of us. Our membership doubled and redoubled. No longer did we bear the stigma of being a bunch of ''weirdos''. And to really bridge the gap, while other social clubs were honoring our football athletes, we decided to do the same with the Basket-ball heroes, and gave a dance in their honor. That tied the ''C.D.D.'s'' to the athletes, and we were a social success for the first time. We made enough money from the dance and the plant sales to make a large daffodil bed on the campus, and for the planting of some trees as well.

COLLEGE AND UNIVERSITY, 1947-1953

When I went away to college, I found that this enabled me to see more of the bulbs of Texas, and I was able to add several species new-to-me to my cultivated natives. In the Dallas-Fort Worth area I collected *Camassia scilloides, Androstephium caeruleum, Zygadenus nutallii, Allium hyacinthoides,* and *Allium acetabulum.* While at North Texas Agricultural College, I pursued my Pre-Vet curriculum, which included courses in General Botany and Plant Taxonomy. My own private interests in taxonomy made that course much easier for me than it was for the other struggling students.

After spending two years at N.T.A.C. at Arlington, Texas, I submitted my application for entrance to the School of Veterinary Medicine at Texas A. & M. College, and was accepted, entering in the autumn of 1949, at the age of nineteen. I found the area around the campus in Brazos County rich in bulb life. Here grew the most beautiful forms of *Habranthus texanus* that I had seen, and also the most colorful and robust forms of *Allium drummondii.* By this time, I had discovered the AMERICAN PLANT LIFE SOCIETY and HERBERTIA. I had also discovered Wyndham Hayward and his Lakemont Gardens at Winter Park, Florida, as an important source of *Zephyranthes,* and their kin. Mr. Hayward's list of miniature amaryllids, Crinums, and other bulbs fascinated me and I became a customer and soon a correspondent as well. I began concentrating on collecting *Zephyranthes* and Crinums, in a serious way, and began to consider breeding a few of these plants, and discussed the possibilities with Mr. Hayward in our letters. He then revealed to me the existence of the ''Cooperanthes'', hybrids of S. Percy-Lancaster in India, and suggested that I write Mr. Lancaster and try breeding similar hybrids. I did so, but the plants that Mr. Lancaster shipped to me never arrived—apparently lost in transit. I then decided to create my own hybrids from scratch, and the mating of *Z. citrina* with *Z. rosea* seemed to be a ''natural'' and I began with these two. I had hoped for an intermediate shade between these yellow and pink species, but I got only rose-pink hybrids, one of which I dubbed ''Ruth Page'', in honor of a teacher who had taught mathematics while I attended junior high school. In the meantime, I began corresponding with Victor L. Cory, who was then field botanist at Southern Methodist University, and Mr. Cory was very helpful in identifying my bulbous material, and in giving me whatever information that I needed. His informative letters proved to be a goldmine of information. Through Mr. Cory I was able to contact Fred B. Jones, of Corpus Christi, Texas, and find the discoverer of *Cooperia Jonesii.* At about this same time, I also received an introductory letter from Mrs. Morris Clint of Brownsville, Texas. She too was very much interested in *Zephyranthes* and their allies, and we began corresponding and exchanging bulb material. Suddenly I had hit a bonanza and was knee-high deep in the various amaryllids. Len Woelfle of Cincinnati, Ohio, wrote to me, having received my name from Mr. Hayward. Mr. Woelfle was an avid enthusiast of the *Hymenocallis* group, and he greatly helped spur my interest in them. My circle was beginning to expand, and I suddenly found myself becoming a member of the ''in'' group of enthusiasts, as I corresponded with all sorts of enthusiasts in the amaryllid bulb-world. It reached its peak in August of 1952, when I visited my Dad in Van Nuys, California. I then had a chance to visit Oakhurst Gardens and finally meet James Giridlian in person! It was a fateful meeting. Mr. Giridlian was an affable host, and immediately perceived that I seemed to know his plants unusually well, and he so remarked. ''I OUGHT to'', I said. ''I've studied your catalogs for years and practically know them by heart''. We hit it off well, and before I left, he made me promise that I would collect native Texas bulbs for him and that he would pay me for them. Upon returning to college in the fall of 1952, I suddenly found myself in business collecting bulbs for Mr. Giridlian, and shortly thereafter for Rex Pearce, and even a few for Mr. Hayward. It was welcome income for a college student on only a limited allowance from home. I only regret that I had not started a few years earlier. Throughout the following years, Mr. Giridlian was to be my most loyal regular customer. Through him I was not only to introduce many Texas natives, but later on many of my own hybrids, and Mexican species as well. We were to be come fast friends and later travel together on a collecting expedition into Mexico and Guatemala. My friendship with Fred Jones and Mr. and Mrs. Clint was to continue growing too, along with that of Len Woelfle. During this same period, I was to correspond with Mrs. Grace Primo, of Mobile, Alabama, a charming and enthusiastic person who was known for her love of Crinums and other amaryllids, and Dr. C. W. Hall of Austin, Texas, also another *Crinum* fancier. Through Len Woelfle I was to expand the circle by contacts with Joe Werling of Los Angeles, and Les Hannibal of Fair Oaks, California. Another Californian, Dr. Leo Brewer, was to become one of my most constant correspondents, until his untimely death a few years ago. The circle grew ever larger.

PROFESSIONAL CAREER, SINCE 1953

I graduated from College in June of 1953. The Korean war was over, but I went into the service about a month after graduation as a Lieutenant in the Veterinary Corps. My first assignment was the Meat and Dairy Hygiene School in Chicago where I was to receive training as a food inspector. During the few weeks between graduation and my commission, I managed to make a quick trip to Mexico City and back with a friend, and make a few collections of *Zephyranthes* along the way. The events of this trip were published in the 1954 edition of HERBERTIA. During this trip, I had found what turned out to be my first undescribed *Zephyranthes,* and perhaps a second undescribed species as well, along with *Z. verecunda* and *Cooperia drummondii.* Midway between Valles and Tamazunchale I spotted a large colony of light yellow *Zephyranthes* in flower, my #53-1, and this was to begin a long succession of Mexican species, new and rare, in the years to follow.

While stationed in Chicago, I visited Len Woelfle at Cincinnati, Ohio, one week-end, and we became fast friends. I also visited Raymond B. Freeman in suburban Western Springs, just outside Chicago and we talked Alliums. I was then sent to Fort Benning, Georgia, and this gave me opportunity to meet with Wyndham Hayward and Mulford B. Foster. (see Visits With Plant Enthusiasts, parts 1 and 2, HERBERTIA, 1955 and 1957) The collector instinct in my blood did not fail me during this period, and I was able to collect a late summer flowering *Allium* for James Giridlian, while at Chicago, and *Z. atamasco* from Georgia the following spring. By the summer of 1954 I was back in

Texas, at Fort Hood, and I spent a two week's vacation in Mexico that August. More plants collected . . . *Zephyranthes, Hymenocallis, Bessera, Milla, Tigridia, Nemastylis.* The following summer (1955) I found a new large yellow-flowered *Zephyranthes* at Mamulique Pass, about 40 miles north of Monterrey, Mexico. This was ultimately to bear my name as *Zephyranthes Howardii* Traub, and I was to formally receive credit as the discoverer of a newly described species at last! In 1956 I was to flower my first hybrid *Crinum* seedling, a gorgeous rose-red thing that was distinctively different from any other hybrid in this color range. By using my *Zephyranthes* hybrid 'Ruth Page' as a seed parent, I suddenly was getting a variety of unusual and beautifully colored *Zephyranthes* hybrids in a broad color range. I had finally made my break-through. I began concentrating on hybridizing more and more. Mr. and Mrs. Clint were busily collecting in Mexico. Fred Jones went with them once. They were finding new species right and left. I was starting into private practice as a small animal practitioner and had little time (or finances) for any trips into Mexico and I had to stay home and mind the store. But my hybrids kept me busy, and I found them to be profitable, as Mr. Giridlian continued introducing them, as did Robert D. Goedert. In 1962 I began once more to collect in Mexico, and suddenly I had the field to myself. The Clints had greatly curtailed their activities as Mr. Clint's health began to fail. By then Mrs. Clint and Fred Jones had both become HERBERT MEDALISTS.

My circle of bulb-enthuasists had broken. Mrs. Primo had died. Dr. Leo Brewer had died. Cecil Houdyshel had died. Wyndham Hayward had retired, and so had Rex Pearce. Then in 1964, I was to learn that my good friend, Len Woelfle had died of a heart attack. Suddenly I realized that I was alone in many ways. Len was the heart of my interest in *Hymenocallis.* His death came just as I was beginning to discover a wealth of new *Hymenocallis* species in Western Mexico. How thrilled he would have been if he could only have lived a few more years or so in order to see the new explosion of species in this genus. He loved to hybridize them and he was on the threshold of an entirely new deck of cards to play with.

Meantime my collections had turned up many new Irids within *Tigridia* and allied genera. I was to soon correspond with Elwood Molseed, a graduate student at Berkeley, intensely interested in these little known Irids. Our correspondence was to last but a few brief years, as Mr. Molseed's life was to end prematurely, a victim of cancer. His work is soon to be published.

Then in 1966 I was honored by having Jimmy Giridlian accompany me on a field trip to Mexico and Guatemala. It was an eventful trip, and we found several new species, including a new *Allium* in Guatemala. He thoroughly enjoyed himself and little did either of us know that he would never again make another such trip. He died quite suddenly and unexpectedly in the spring of 1969, and another friend of the bulb-world has been taken from us. Claude Davis is gone now, as is Morris Clint. In 1967 Les Hannibal honored me with his company on another Mexican field trip.

I consider myself fortunate in having known and mingled amongst such an illustrious crew in this ''passing parade''. Each one has contributed something to me personally, and to enthusiasts of amaryllids and other bulbs as well. . . . Grace Primo, Victor L. Cory, Charlotte Hoak, Cecil Houdyshel, James Giridlian, Claude Davis, Morris Clint, Len Woelfle, Leo Brewer, Elwood Molseed. If I have overlooked any other late friends, it is unintentional. Each played an important part to a greater or lesser extent, in keeping my interest high.

I managed to do a good bit of traveling the past decade and a half, and have met with many interesting people, not the least of whom is our own editor of the APLS, Dr. Hamilton P. Traub. Dr. Traub is naturally keenly interested in all of the new amaryllid material that I bring back on my trips. The sudden unexpected windfall of Mexican and Central American *Allium* species caught him quite unawares, and resulted in his overhauling in the very short space of time since 1967 the genus as it is found in Mexico and Central America. I have taken a lot of kidding about my interest in the Onion Family from non-gardening friends over the years, but the irony of it all is that it is these same onions that led me to the place that I stand today, as the recipient of the HERBERT MEDAL! So you see, it pays to know your onions, if I may be allowed the luxury of a quip. Somehow I had always thought that if it ever really should happen, it would be because of my interest in the *Zephyranthes,* both as a hybridist and as a collector of new species. It is fitting that my love for the humble onion be my reward. Perhaps ultimately my discoveries may be equally divided among not only *Allium,* but *Milla, Hymenocallis,* and *Zephyranthes.* It will take several more years before the final score is tallied. Meanwhile it remains ironic that my very first new discovery is as yet still undescribed! It may well be one of the very last to be named, if at all.

In conclusion, I might add that I had an early start, indeed far earlier than most, and I had expert advice and help along the way. Any young aspirant can do the same, if he really wants to do so. A little tenacity helps, particularly in this field of endeavor, unless one (unlike myself) is blessed with an unusually brilliant ability.

Some readers are aware that I have been a part-time hobbyist, and part time bulb-nursery-man on the side, although as a nurseryman, I have been a poor businessman, not being able to always devote enough time to the business end of the hobby, or for that matter, the hobby itself. Unfortunately, we are running out of bulb sources. The old specialists are dying out and there are none to replace them. The bulb gardeners of the world are poorer for it.

Last but not least, I should like to thank the students who have assisted me on my trips over the years, even though I often drove them at a wicked pace up and down the mountain sides. They climbed trees for me, scaled cliffs with me, waded streams, and into mucky swamps for plants they did not know the names of. They dug until their hands blistered, often got caught in sudden downpours, and occasionally suffered the effects of the ''Revenge of Montezuma''. These former students and former employees were Chris Abee, Charles Curtis, Reggie Jackson, and Dale Redding. Their reward was adventure and unforgettable memories of a Mexico that few tourists ever see. Thank you gentlemen. Thank you ALL.

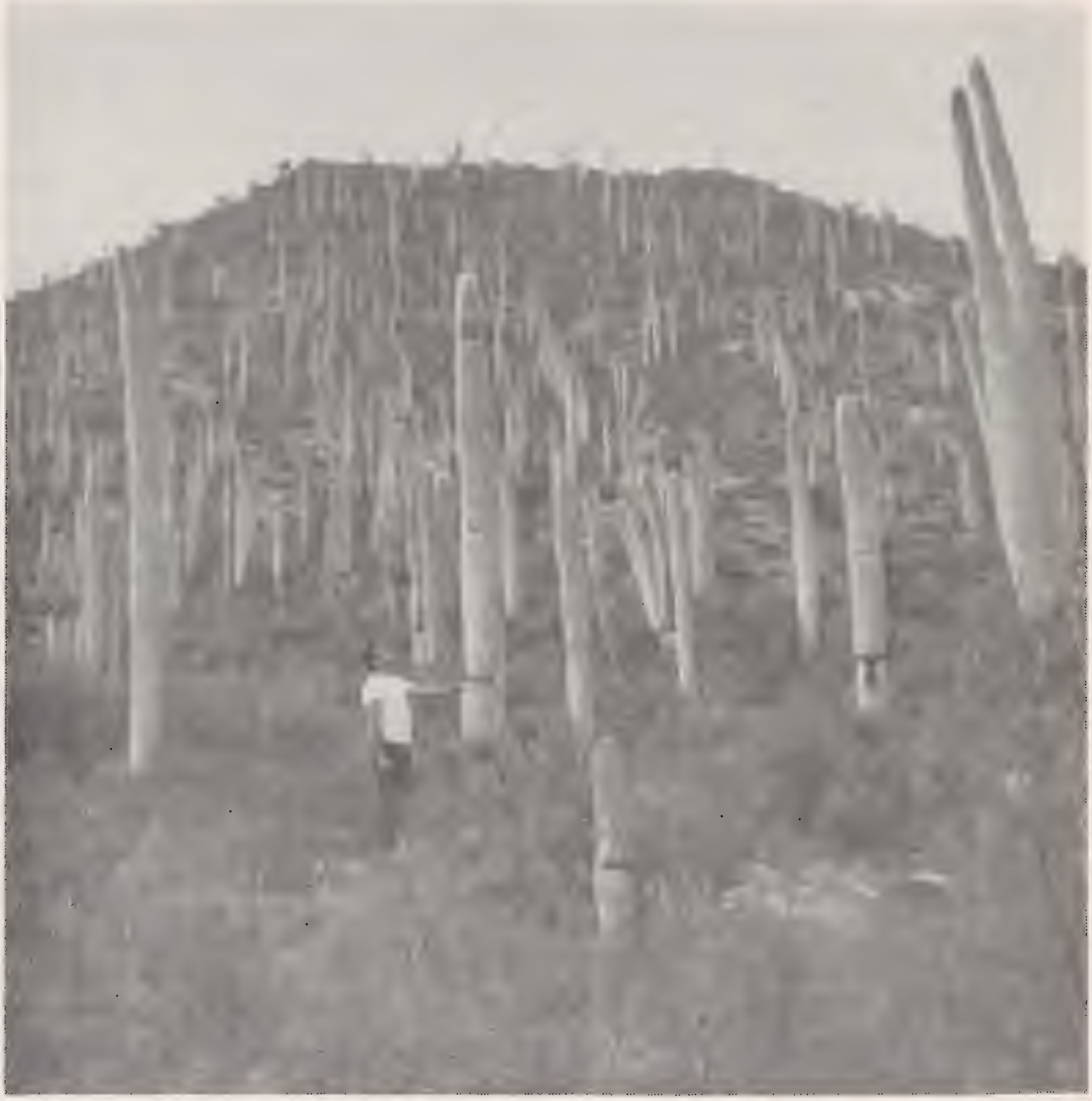

Fig. 2. Dr. Thad M. Howard among giant columnar cacti, *Cephalocereus hoppenstedtii,* south of Tehuacan, Puebla; elevation in excess of 5,000 ft. *Sprekelia formosissima* are sometimes found beneath these cacti; several new *Milla* species (62-44, and 68-252) were found in this area. Photo by Reggie Jackson, July 11, 1968.

SOME BULBOUS AND CORMOUS PLANTS OF MEXICO AND GUATEMALA

Thad M. Howard, Jr., *9138 San Pedro Av.,*
San Antonio, Texas 78213

Many readers of the American Plant Life Society over the past seventeen years may possibly be aware of the many plant explorations made in Mexico and adjacent Guatemala by the writer, beginning in 1953, and continuing until the present time. The writer began collecting bulbs as a sideline while vacationing as a typical tourist. The first probe was in 1953, and a second trip was made a year later, during the month of August. The first trip was only to Mexico City, but the second trip also included Oaxaca, roughly 300 miles southeastward. Both trips resulted in excellent garden material and included many new species unfamiliar to me, a few of which were later to prove new to science as well. In 1955 the writer went no deeper into Mexico than Monterrey, in Nuevo Leon, but even then an important new yellow-flowering *Zephyranthes* (*Z. howardii* Traub) was accidentally discovered in flower, in what seemed to be an unlikely place. In 1957 a deeper probe into Mexico (still only as a tourist) took me into the state of Guerrero, while visiting Acapulco. This too yielded some more interesting discoveries, and helped add a bit more information for me about some of the varied bulbous and cormous plants to be found south and west of Mexico City. Then came a drought as far as my tourist vacations were concerned, and my trips were to take me no further than Monterrey for the next several years. In 1962 I began once more making annual probes deeply into Mexico, as genuine field trips, with the purpose of collecting plants as my main objective; and I became only incidentally a vacationing tourist. Thus began a new chapter in my explorations, and with it came a more serious and adventurous approach. I began keeping better records of the plants collected, and also began collecting each species in larger numbers, where once a mere handful of a dozen or less of each might have sufficed. I now always had a companion to assist me in the task of digging, counting, cleaning, labeling, and recording the bulbs collected. As my collections grew in number, my interests grew as well and I began collecting not only bulbs, but cacti and bromeliads as well. Eventually I was to add orchids, begonias, aroids, and ferns to my list . . . even carnivorous plants! In time a pattern began to formulate about the distribution of the various plants and I began to have a better intuition in "predicting" where a new species might turn up. But as always, there were the inevitable surprises, proving once again that there are exceptions to every rule. I will now attempt to summarize information that I have gained about the various genera and species that I have encountered among the Amaryllis Family as well as other bulbous plants found south of the Rio Grande River.

I. THE GENUS **SPREKELIA**

Until recently *Sprekelia formosissima* was the only species of this genus known from Mexico, and was considered to be a monotypic genus having many varying forms by many authorities. I first began collecting sprekelias with the idea of adding as many variations as I could to my collection with the idea of using them for hybridizing. As my collection grew, it became apparent that not all could be considered so loosely as mere ''variants''. One in particular, a glaucous leaved individual, with pinkish-red flowers, seemed somehow to be a breed apart. Unfortunately, this species, which I referred to as ''*S. glauca*'' came from a source where it was cultivated in the city of Guanajuato, and I had no idea exactly where its native habitat might be. In 1967 we found sprekelias with similar glaucous leaves in the state of Michoacan growing at intermediate levels under fairly dry conditions (for *Sprekelia*). Incidentally, the writer has heard so many interested parties mispronounce the name ''Michoacan'', that I should like to take this opportunity to suggest that the proper phonetic effort should sound more like ''Meech-wah-KAHN'' than some of the clumsy efforts I have witnessed. Another seemingly difficult word is Oaxaca. This is really not difficult if one simply ignores the ''x'' and pronounces it as an ''h''. Then following the rule in Spanish, each and every vowel is pronounced separately (unlike English, where some letters are silent) and the ''o'' and ''a'' come out ''O-ah'', or more simply ''wah'', since ''O-ah'', when said rapidly is ''wah'', and thus we get ''Wah-HOCK-a'' phonetically. Simple, isn't it? But back to *sprekelias.*

The glaucous leaved *sprekelias* seem to have certain characteristics suggestive of *Habranthus.* Indeed, Dr. Traub caused a lot of raised eyebrows years ago when he had the audacity to declare that *Sprekelia* was NOT a closely related ally to the genus *Amaryllis,* but they were in fact much more closely akin to *Zephyranthes* and *Habranthus!* Later evidence supported this theory when the writer first successfully hybridized *sprekelia* with a hybrid *Zephyranthes.* The seedlings showed obvious heterosis (hybrid vigor) quite unlike typical *Zephyranthes.* Unfortunately they were lost the following winter during an unusually cold spell. In the 1969 edition of PLANT LIFE a successful hybridization between *sprekelia* and *Habranthus* is illustrated, and we now have *sprekanthus* added to our cultivated ornamentals. Indeed, the writer collected what was thought to be a small ''*Habranthus*'' in the southern limits of the state of Puebla, and later in the adjacent northern limits of the state of Oaxaca. Eventually my ''Habranthus'' flowered, and as the scape developed I was surprised to notice that the bud emerging from the spathe was deep red, and unusually long and slender. You can imagine my shock when this strange miniature ''Habranthus'' opened to reveal itself as a new *sprekelia* species! Unlike the common forms of *S. formosissima,* this tiny mite had bulbs no larger than a *Zephyranthes,* with relatively narrow silvery green foliage, distinctly keeled. The flower was less than 10″ tall with spidery red segments no wider than those of a typical *Hymenocallis.* The effect was that of a slender red ''spider''. No question about it, this was a new and most distinctive species, and not merely another ''form'' of *S. formosissima.* A few years later I was to find this miniature *sprekelia* growing in a mixed colony with the larger *S. formosissima.* No evidence of intermediates through hybridization could be found, and the evidence suggests that it is not genetically likely. The miniature species is easily separated from the larger species, in both leaf and flower. Since then, I have collected additional *sprekelias* similar to this miniature species in the states of Guerrero and Colima, and they seem to be fairly well distributed along the mountain chain along the Pacific (western) side of Southern Mexico. They are found at somewhat lower elevations than the typical species, and in somewhat dryer country, on rocky hillsides, beneath giant cacti and thorny shrubbery. This *Sprekelia* was first collected by me in 1962, as a *''Zephyranthes'',* not in flower, at Kilometer 341, about 5 miles north of Huajuapan de Leon, in northern Oaxaca as #62-21. The following year I collected it a bit further north near the Puebla-Oaxaca state lines in southern Puebla (Kilometer 302), just north of Petlalcingo, Puebla, and this one is catalogued #63-34. The same species was collected again at K 312, northern Oaxaca shortly afterwards. In 1964 it was recollected in this same general area, south of Acatlan, in southern Puebla, at K 304, as always along the roadsides of Mexico 190, and as always (at this time of the summer) in leaf. In 1965, I collected a similar *Sprekelia* in leaf and in fruit, in the state of Colima, and this was catalogued as #65-47. It grew in company with an unusual large-flowered yellow *Nemastylis, N. molseediana* sp. nov. (syn. *N. mcvaughii*) at K-240, on Mexico #110. As was the case with the miniatures from the Puebla-Oaxaca state lines, this *Sprekelia* was no larger than a *Zephyranthes* in leaf and fruit, though the seed capsule was a bit larger than that of most typical Mexican *Zephyranthes.*

The finding of this *Sprekelia* extended the known range of this species considerably northwestward up the coast. In the summer of 1966, this same *Sprekelia* was found again in a new locale, in the state of Guerrero, on an unpaved road below Iguala, just off Mexico 95, and catalogued as 66-64. Now its range was known to include not only the borders of Puebla and Oaxaca, but similar ecological environments in the states of Guerrero and Colima. In general, it might be said that this miniature species is found inland on the western (Pacific) chain of mountains in Southwestern Mexico at lower, intermediate altitudes, around 3000 feet, in dryer wooded areas where thorny shrubs and giant columnar cacti (such as *Neobubaumia tetetzo*) are found. Sometimes, it may be found growing alongside *S. formosissima,* but apparently they do not hybridize, and they are easily distinguished from one another in their vegetative characteristics. One might wonder how this miniature species has been so long overlooked by botanists since it is not all that uncommon within its range. The explanation is simple. The plant is so tiny that when not in flower, it might easily be mistaken for a Rain-Lily (*Zephyranthes, Cooperia,* or *Habranthus*). The flowering season is limited to the earliest summer rains, with but a single flower being produced and the flower lasting only one or two days at most. The flower is small and spidery and is a muddy light red that might easily be overlooked. I find it chary of flowering, and likely only the largest bulbs will flower, and these are slow to reach maturity. Unlike many of the commoner garden *sprekelias,* this one does not grow vigorously. As cultivated Sprekelias go this one is relatively unexciting. But as a miniature member of the genus, it is indeed an exciting plant when grown in company with other *Amaryllid* miniatures, (such as *Zephyranthes* and *Habranthus*) with its spidery red flowers contrasting nicely and adding the variety and interest of the orchid-like form characteristic of the members of this genus. This wee *Sprekelia* was found again in the state of Colima in 1967 (#67-52) at kilometer 241 on Mexico 15, in limestone.

I do not know exactly what the northern limits of *S. formosissima* are, but it is to be found on both the western (Pacific) chain of Sierra Madre (Sierra Madre Occidental) and the eastern chain, Sierra Madre Oriental, beginning in the State of Chihuahua on the western range and the States of San Luis Potosi and Hidalgo on its eastern range. These forms are strictly alpine plants, and one does not look for them until the elevation exceeds 6000 feet, and they more normally occur on up to around 10,000 feet elevation. One does not look for ''fields of *Sprekelias*''. Instead, one expects to find them in small colonies in pockets of humus, wedged between crevices in rocks on hillsides and mountain sides. The large black skinned bulbs may go quite deeply. Because of their typically orchid-form, many natives consider them to be red flowered orchids. As with their rain-lily cousins, Sprekelias are triggered into bloom with the earliest summer rains, and they get the chore of flowering over quickly. Usually only the very largest bulbs will flower, and they must be extra large to produce more than a single scape. As one travels southward, eastward, and westward from Mexico City, they may be found growing also in dryer, semi-arid country beneath cacti. But even then, the elevation is typically high at 3000 feet or more. They are NOT to be found at lower, tropical elevations, nor anywhere where the ground is flat. The individuals may differ considerably, even within the same colony, in varying shades of red. In cultivation many *Sprekelia* clones are self-sterile, but produce seed heavily when pollinated with pollen of *Sprekelias* from different clones. Some of the cultivated forms are evergreen, but most Mexican *Sprekelias* are naturally deciduous in winter, and during dry periods.

In 1967 I finally found a glaucous leaved *Sprekelia* in the wild in the state of Michoacan. Some had flowered recently and were just past the fruiting stage. In cultivation these have light red flowers, smallish in size, and with narrow segments. Nothing spectacular as Sprekelias go, from an ornamental standpoint, but having the pleasing personality and form of the genus. Whether or not this is *S. clintiae, S. glauca,* or something else remains to be seen. Certainly these glaucous natives of Michoacan are not identical to the glaucous leaved specimens that I found in cultivation in the city of Guanajuato in 1957. The Michoacan *Sprekelia* was given the collection number #67-68, and was found on a shaded hillside on then-unpaved Mexico 37, about 30 miles north of Arteaga. They grew in company with vividly scarlet forms of *Bessera elegans.*

I cannot definitely state exactly all the States in which one might expect to find *Sprekelia* in Mexico, but I have collected them in the following: San Luis Potosi, Hidalgo, Mexico, Michoacan, Jalisco, Puebla, Oaxaca, Guerrero, Colima, Nayarit, and Durango. They are know from the State of Chihuahua, and it is reasonable to assume that they are to be found in other states such as Chiapas, Veracruz, Queretaro, Zacatecas, Aguascalientes, Sinaloa, and perhaps even Sonora. Indeed, almost anywhere in higher elevations sufficiently southward where winter temperatures rarely go much below freezing for any period of time. As with most plants, one looks for them where grazing by goats has not eliminated them. Hungry livestock take a heavy toll of ornamental plantlife.

II. THE TRIBE MILLEAE: MILLA, BESSERA, PETRONYMPHE, DIPHALANGIUM AND DANDYA

In discussing the bulbous amaryllids of Mexico, one is hard pressed to pick a favorite. There are so many species and genera from which to choose. As an amature botanist and plant collector-explorer, I might be inclined to lean toward the gaudier, more-popular genera, such as *Zephyranthes, Habranthus,* or *Sprekelia.* But sentimentally my heart likely will lean towards the lesser known beauties such as the *Millinae . . . Bessera, Milla, Petronymphe,* and *Dandya.* Why? Well because, aside from their recognized ornamental value, they have been very good to me. In the genus *Milla,* I found an entire galaxy of undescribed species. Those who think that they know *Milla,* will recognize it as a cormous plant, flowering in summer with loose umbels of waxy white fragrant flowers, each petal keeled with a contrasting green stripe on the backside a-la-Star-of-Bethlehem (*Ornithogalum*). But there the generalization ends. *Milla biflora* is by far the best known species, and until not too long ago was the *Only* recognized species until Dr. H. E. Moore added several new species to a genus that was thought to contain but two species (*M. biflora* and *M. bryanii*) in his monograph on *The Genus Milla and its Allies.* Since then, it has been my good fortune to add enough new species to the fold to more than double the known half-dozen recognized species. A new monograph is in the making and will shortly (we hope) be published . . . perhaps within a year or so of this writing (summer 1969). Because of the pending publication, it is impossible to give the new names-to-be of the new Milla species. But readers of Plant Life will no doubt be familiar with some of them, as I have referred to them as numbers in writings of plant explorations of other years.

In general, I might state that the genus is roughly divided between those that flower only at night, opening in late afternoon and closing before sunrise, and those that remain open throughout the day. They may be further divided between those which have corms that form offsets in the ordinary manner, with basally attached cormels, and those which produce the cormels at the end of underground "runners" or rhizomes. Bulbs produced at the end of rhizomes are well-known in such genera as *Oxalis, Tulipa, Crinum, Hymenocallis, Allium,* etc. We see this commonly in *Tulipa clusiana,* and *Crinum americanum,* and such species are spoken of as being rhizomatous. We find this frequently among

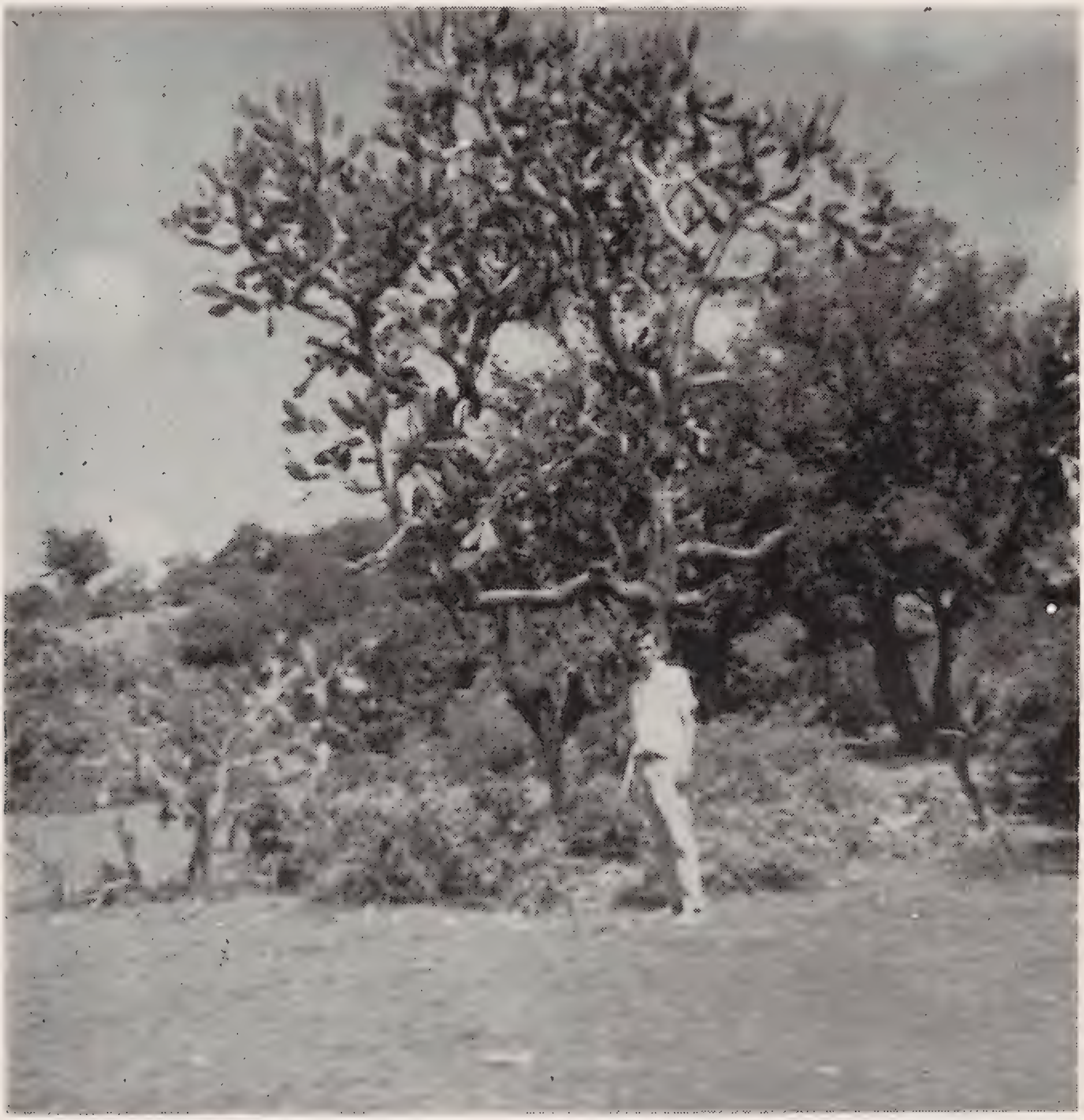

Fig. 3. Reggie Jackson among giant arborescent *Opuntia* species. This is the nomenifer locality of *Zephyranthes* 68-223, a tiny white-flowered species from Placeres del Oro, Guerrero, west of Coyuca de Catalan. *Dandya* No. 68-222 is also found in this area. Photo by Thad M. Howard, July 4, 1968.

Mexican *Allium, Oxalis,* and *Milla* species. In a nutshell, this writer was apparently the first to observe that the cormous Millas could propagate in this manner in certain species. Simultaneously the writer also observed that many *Milla* flowers opened only at night. Suddenly we had an avalanche of new species that had previously been loosely lumped as *M. ''biflora''!* Later chromosome studies by Dr. Lee Lenz of Rancho Santa Ana Botanic gardens bore this out. Each and every alleged new species submitted by the writer as apparently being a ''new'' one was in fact *new,* not only morphologically, but cytologically as well. Unfortunately the species of the genus *Milla,* (like its distant relative within the Amaryllidaceae *Hymenocallis*), differ from one another in more subtle characters that makes the subject taxing to most botanists. As with *Hymenocallis,* nearly all *Milla* species (with but few exceptions) are white flowered. All members of the genus *Milla* have the distinctive green ''keel'' on the backside of each segment. All are more or less fragrant. All are cormous. The difference in foliage characters are perhaps the most obvious distinction to the novice. No one should ever confuse the giant *Milla magnifica* with #64-79 (tentatively called M. ''filifolia'' by this writer) as the leaves of the former may be three to five feet in length, thickly rounded and hollow like a garden onion, while the foliage of the latter are wispy, hair-like threads. Again, we find exciting contrast between the giants such as #65-77 from the north eastern borders of the state of Guerrero, which may be a yard high with up to 25 flowers in the umbel, with #68-235, from northern Oaxaca, which bears one or two large flowers on a stem only an inch tall! The latter appear like snowy summer crocus when seen at their best.

The geographical limits of the genus *Milla* is mainly within the limits of Mexico, with one species spilling over into Guatemala on the southern limits and another species or two pushing northward into the Big Bend mountains of Texas, and into southern Arizona and New Mexico. With the publication of Dr. Moore's monograph, the genus was known to include not only *M. biflora* and *M. bryanii,* but also *M. rosea, M. magnifica, M. delicata,* and *M. mortoniana.* Certainly these seemed exciting enough, since the virtues of *M. magnifica* seemed to destine this beauty to eventual horticultural immortality. Who can resist a stiff stalk two feet tall, bearing an umbel of waxy, sweetly scented white flowers on a balmy moonlit summer evening (especially when the plant is so very easy to grow under ordinary conditions). The same cannot be said of *M. rosea,* which is a stubborn, fickle, unpredictable thing. The latter may or may not even attempt to sprout that particular year, choosing instead to remain dormant, for no apparent reason. Incidentally, we find that *M. rosea* is as misnamed as its better known cousin *M. biflora.* Just as *M. biflora* is not necessarily a two flowered plant (it may have one to twelve flowers in an umbel, and normally has more than two flowers per scape), so *M. rosea is Not* a rose flowered *Milla;* The ''rosiness'' is really an allusion to the rose-red to brown-red markings on the under surface of each segment bordering the green keel! And only cool temperatures will produce this pigmentation enough to warrant the name. If the weather should be very hot during the normal early autumn flowering period of *M. rosea,* the flowers may be so little pigmented as to hardly suggest any of its ''rosy'' reputation. Fortunately we usually find it cool enough in October to bring out this pigmentation in our climate, but the earliest ones of early September are apt to be woefully bleached. I will return to *M. rosea* later, but in all fairness, though it was misnamed, it *is* a truly lovely and unique species within the genus.

Alas, I am forced to admit that I have never seen either *M. delicata,* allegedly a small pink *Milla* species, or *M. mortoniana,* allegedly a blue flowered species. Both are from the State of Guerrero, and both are a color departure from the norm. I have spent many dollars and many days the past several years in quest of either of these two illusive species, but have yet to succeed in finding them. Indeed Dr. Moore never found them either, the species having been collected and submitted by Hinton in 1936. Mr. Hinton lived in Guerrero for a time and this botanist found things that others are still looking for. Dr. Moore's descriptions are based on Hinton's notes and the dried specimens submitted by him at the time. I have no doubt that *M. mortoniana* is indeed a quite *blue* species as far as the color spectrum is concerned, but I'm most curious as to exactly what shade (or shades) of blue it might be. At any rate it is only something to ruminate over, since we have yet to feast our eyes upon living material, in ''living color''. *Milla bryanii* is almost as illusive. The few corms that I have were collected for me by someone else in Coahuila. I finally flowered these and find that they are very close to *M. rosea,* although mine lacked any tinge of pink along the keel, and they bloomed about a month earlier. Flowers were a bit smaller than those of *M. rosea,* and they agree with the original description in every way. They remain open both day and night, and have distinct pedicels. The leaves are fewer in number than those of *M. rosea,* and though quite slender, they are distinctly hollow, like those of an onion. The flowers are white and are distinctly pediceled. It comes from northern Mexico, in a mountain range west of that of *M. rosea.* It has very slender leaves, and that are *hollow* (!) in cross section. It produces only basally attached cormels.

The remaining *Milla* species are all still unpublished and officially unnamed, bearing only my collection numbers. Unofficially I have given them ''nick-names'' which are convenient to me at the moment. These nick-names may or may not remain permanently attached to them after publication of the pending monograph by Dr. Lenz.

At the moment it is difficult to classify them only according to whether they remain open during the day-time, or whether or not they produce cormels at the end of rhizomes, since these characters are not consistent from one species to the next . . . i.e.—most often the nocturnal bloomers produce stolons, but a few do not. Likewise, at least one day-night bloomer produces rhizomes, even though this is the exception from the rule within the day blooming species.

The genus, as stated earlier, is to be found from the northern Mexican border to the southern border. A few may spill over the Sierra Madre mountain ranges (eastern and Western) but in general they are to be found inland, cradled within the mountains and valleys after leaving the Gulf and Pacific coasts. I have collected *M. biflora* on the Pacific side, inland, in rolling country along roadsides in the state of Nayarit, south of Acaponeta in 1967. But this is an exception to the rule, as this species is normally found inland on the other side of the mountains at a much higher elevation. Likewise we find *M. rosea* north of Monterrey, in the State of Nuevo Leon at an elevation of less than 2000 feet. But this species is likewise an exception to the rule. The majority of the species are found farther inland at higher altitudes. *Milla biflora,* has the widest range, being found over much of Mexican Central Plateau, and is apt to be the *Milla* that one might encounter at higher altitudes. From an evolutionary standpoint it has been theorized that it is a *Milla* of more recent origin, since it is often found on mountains of volcanic origin. It is not alone in this respect though, as *Milla* ''filifolia'' (#64-79) likewise is to be found on terrain of volcanic type. Doubtless there are others.

Milla biflora and its allies are exceptional in that they are both day and night bloomers, with flowers opening during the day and remaining open both day and night for several days. Although they are fragrant, the fragrance is nil during the daylight hours, but becoming pronounced with the cool of the evening. Thus far only one member of this section produces offsets in the form of underground runners (#68-250, Puebla). Basally attached cormels are the rule. *Milla biflora* is noteworthy in that the individual flowers lack distinct pedicels. Indeed *M. biflora* is considered to be ''sessile'', but unfortunately, this is not technically a rigid rule. Quite frequently we do find poorly developed pedicels (actually pseudopedicels) of sorts that are apt to confuse not only the novice, but the ''expert'' as well. In general, we might safely state that the pedicels, if at all preset, are very rudimentary and poorly developed. They barely qualify as pseudo-pedicels at their best. In the case of #68-235, from northern Oaxaca, we find that these pseudo-pedicels are absent (or very nearly so) so as to make for a sessile-flowered Milla species. In this instance we find a closely related species akin to *M. biflora,* but with ultra-short scapes . . . pubescent stems but an inch tall, and floral tubes only 2 inches long. By contrast, the flowers are proportionately quite large, being almost 2 inches broad. This *Milla* is to be found in grassy pastures north of Yanhuitlan, at an elevation of around 7000 feet above sea level. For years, the writer had seen them flowering along the roadside, while enroute to the City of Oaxaca, always thinking that they were only stunted forms of *M. biflora,* no doubt the result of much overgrazing. The reader may imagine my surprise when in 1968 I stopped to verify if my assumption was correct. It was *not*! Not only did my plants have minutely pubescent stems, but the overly large flowers had stems much too short, and tubes much too short to do justice to any forms of *M. biflora* that I had seen. When other factors (corm, leaves) were taken into consideration, it became apparent that I had been fooled much too long. This was *not M. biflora* at all, but a strange new vegetable.

I did not have quite so much trouble with *Milla* species *64-79,* although it too fooled me for a few years. This tiny mite is quite similar to *M. biflora,* and grows in the same general range in the states of Morelos and Mexico in volcanic soils. Close inspection reveals that this miniature has very tiny corms (1-1.5 cm in diameter), extremely narrow leaves only 1 mm wide, and quite thread-like. Incidentally I find that this 1 mm width is constant, regardless of corm size! The tiniest corm may produce but a single leaf 1 mm wide, while a mature corm will produce 4-6 leaves, still only 1 mm wide. These slender leaves are rounded in cross-section, with a hair-line groove going the entire length of the upper surface. The flower stem is distinctly pubescent, heavily ''furred'' with minute fuzz from top to bottom. This fine ''fuzz'' is found even on the pseudo-pedicels and/or pedicels of each flower. The flowers themselves are of typical *Milla* form, white with green stripe on the backside, but often this green stripe has a good bit of purple-blush adjacent to it. These have stamen filaments nearly twice as long as *M. biflora* (to 1 mm), and the green keels are of a softer olive-green color than one normally expects in other *Milla*. In nature this species is found growing amongst lava rocks in open grassy pastures (Morelos), or on sunny hillsides in soil of limestone character (Mexico). The type location for it is just East of Cuernavaca in the State of Morelos. This *Milla* species will shortly be described in Dr. Lenz's forthcoming monograph. The writer has no idea what the ultimate name for it will be, but *M. ''filifolia''* seems as accurately descriptive a name as any at this point.

The writer must confess that filiform leaves are not unique to this *Milla* species. In my July field trip in 1968, I found two new distinct *Milla* species in southern Puebla in a single afternoon; one having thread-like leaves similar to *M.* ''filifolia''. This new dwarf bears the collection number 68-250. A day bloomer, this one has single-flowered umbels in every specimen seen thus far. Moreover, it produces its cormous offsets by way of underground rhizomes (!) as do some of the larger species within the genus. It is too early to state that this new species will *always* bear only single-flowered scapes, as the umbel is the rule in this family, but after examining several hundreds of these in flower, I could not find a single exception at that time. Under cultivation, it has maintained this characteristic. Certainly we would not wish to see a new error introduced as was done when *M. biflora* was named. The latter may have up to twelve flowers in the umbel, and two flowered scapes are the exception rather than the rule, with more flowers being more usual. Another unusual feature of *Milla 68-250* is the fact that any pedicels are lacking. Pedicels or pseudopedicels are the rule in the genus, and only a few others (such as *M. biflora* are considered sessile. This new species was found flowering along the roadsides along Mexico 125, about a kilometer south of Acatepec in southern Puebla. From a distance it resembled *M. biflora,* and would ordinarily be confused as such by the untrained eye. Were it not for the rhizome information, I know I would not have been so sure about its being anything other than a very slender leaved *M. biflora.* When we consider all the important characters (rhizome formation, filiform leaves, sessile, one-flowered scapes, flowering in the daytime) it is easy to see that we have enough distinguishing features to prevent its being confused with any other species.

As though the finding of a new *Milla* species in one afternoon were not enough, I was fortunate enough to experience this same thrill again in a little over an hour! This time my discovery was a night blooming species (*Milla 68-252*) with very slender leaves and minus any signs of rhizomes. The fragrant white flowers had green keels on the underside strongly flushed wine-red. The leaves were nearly filiform, being only 1-1.5 mm wide and about 24 cm long, dark green, purplish at the base, canaliculate above, rounded below, nearly terete. There were 2-3 sweetly scented flowers to the umbel with poorly developed pseudo-pedicels, unequal in length, 1.5 to 5 cm long. I was truly astounded at finding this new *Milla,* since I was in a territory where another closely allied *Milla* species grows (*Milla 62-44*) which I first found here in 1962. The latter is a giant rhizomatous type with terete, scabrous leaves, and flowering in late summer. The new discovery had similar flowers, but there the similarity ended, since foliage and vegetative reproduction were quite different, and the flowering season was at least a month earlier than that of *62-44.* This appears to be a very localized species, since I have never run across this one before, whereas I have collected *Milla 62-44* in many different places in southern Puebla. Only time and more study will tell us if *Milla 68-252* is indeed a new species or not. In many respects it is similar to *Milla #67-84* (and 67-85), from San Luis Potosi. The latter is likewise a night bloomer with slender foliage, and without any rhizome formation. The foliage of this more northerly species is greyish green, and averages at least a half millimeter wider. The stamen filaments of the *Milla* from San Luis Potosi are much shorter (as with *M. biflora*), being 1 mm or less in length. Ultimately both *Milla 68-252* from Puebla, and *Milla 67-84* from San Luis Potosi would have to be compared with *M. bryanii* in order to see how each differs or compares. (Note: Later comparisons showed them to be distinct from one another.) Certainly each is geographically isolated from the other sufficiently enough to make one suspicious that they need not be the same species. Chromosome studies should be of much value here.

The reader might conclude that the variety of species within the genus *Milla* is far from settled, and such a conclusion would be correct.

At this point it appears that *Milla* may be as difficult as *Hymenocallis* for the taxonomist. As an example, take two related Millas from Chiapas (#64-95) and Oaxaca (66-95), with similar flowers. In Oaxaca we find them to be without rhizomes, but with slender grass-like leaves, and small corms. Upon crossing southward into Chiapas, we find that it is replaced by a similar, but more robust species freely forming rhizomes. This latter species extends as far southward as Huehuetenango in Guatemala. Each has a different chromosome number, further giving support that we do indeed have two distinct species, but the relationship is unmistakable. From the gardeners point of view it really does not matter, as we have one of the finest *Milla* species for cultivation in the rhizomatous form (64-95) from Chiapas and Guatemala. Indeed only *M. magnifica* and *M. biflora* are its match under cultivation and even then there might be reason for debate. Certainly no *Milla* is easier to grow and flower than is *#64-95.* Unlike *M. biflora,* the Guatemalan species increases rapidly by vegetative means by the freely produced rhizomes. The umbel may normally contain about a half dozen flowers, but under optimum conditions there may be a long succession of scapes over many months. The flowers are about the same size as those of *M. magnifica,* and have a very sweet fragrance. The species from Oaxaca (#66-95) as stated earlier is similar in flower, but is not as vigorous nor as easy to grow.

There is little reason to doubt that *Milla magnifica* will someday become the ''standard'' *Milla* species in cultivation. Why? Well, for one thing, it has unusually large flowered umbels, with a dozen or more flowers per scape (often as many as two dozen), and it is far easier to grow than *M. biflora.* Some might object to its being an evening bloomer and not ordinarily remaining open during the heat of the day, but others may find this only adds to its charm. A few might object to its unusually long onion-appearing foliage (but without any onion-''smell'') which may reach three feet or more in length. These few long leaves are apt to sprawl untidily as the plant comes into flower and will require staking. But these are minor problems. It is a glorious ''Milla-of-the-Night'', and the perfume is equal to that of tuberoses. *Milla magnifica* is a resident of the state of Guerrero, and is to be found north of Taxco and West of Iguala in the surrounding hills and mountains.

The honor of being the largest *Milla* species does not belong to *M. magnifica,* but to a closely allied species *#65-77.* This latter species is found at the Guerrero-Morelos state lines, and is somewhat intermediate between *M. magnifica* and *M. species 62-44* from Puebla. Under cultivation, #65-77 may be fully a yard tall, and may have 25 flowers in the umbel, sometimes more. Foliage is hollow, as with *M. magnifica,* but the surface is minutely denticulate rather than smooth. In this *Milla* we find offsets may be either basally attached and/or on short rhizomes, often on the same plant. It is quite possible that it may be of hybrid origin since it is to be found midway between the range of

M. magnifica and *#62-44.* It flowers later than *M. magnifica,* but earlier than #62-44. In general it produces scapes fully a foot taller than either *M. magnifica* or *#62-44,* with the largest umbels. Both floral tubes and pedicels are longer than those of *M. magnifica,* both averaging 2 cm more in length. Were it as easy in cultivation as *M. magnifica* then *#65-77* would be my choice among *Milla* garden potentials. Unfortunately I find it rather difficult and erratic—a condition that is not uncommon in this genus. Still it can be quite impressive when one finds it in full flower in the evening on stems 38″ tall.

The State of Guerrero has yet another *Milla* species not yet given scientific rank as a described species. This too is another of the nocturnal bloomers, but without any rhizomes. The writer has nick-named it *Milla ''scabrum''* because of its scabrous foliage, stems, and flowers. For many years its origin was unknown, having been collected many years ago in southern Mexico, presumably as a ''form of *M. biflora*''. In those days I was not yet aware of the many undescribed species in the genus, assuming that there were many ''variations'' and I was content to toss them all into a single bag simply as *''M. biflora* variations''! I can offer little excuse for my gross ignorance, except to say that other so-called ''experts'' before me had made the same error. At any rate, when the many ''variations'' bloomed, I realized that I had stumbled onto something totally unexpected. I had a passel of new species, and ''scabrum'' was one of these. Alas, I had no record of where I had collected it. I could not assign it a collection number that would fit into my system, so I simply gave it the number *Milla #xyz.* I reasoned that it likely was dug in southern Mexico, more likely than not in the state of Guerrero. It was a wild guess, but I was almost willing to gamble on it. As it eventually turned out, I was correct in my ''guess''. In July, 1968, I indeed found this species in leaf in Guerrero, a few miles north of Zumpango on the Acapulco highway. The mystery was solved . . . at least tentatively. The non-rhizome habit, and the terete, scabrous foliage certainly matched my original collection. My earlier clone had a scabrous stem, with the minute bristles extending to the pedicels and even the floral tubes. Flowers were typical of the nocturnal *Milla* types. Further study is needed before anything really definite is done about this *Milla,* but I feel that it will turn out to be another distinctive new species. To be sure, it is not unique in its rough textured leaves and stems, but it is not likely to be confused with anything else.

A *Milla* species collected in both the States of Colima (#65-50) and Michoacan (#65-71) has never flowered for me, although I am hopeful that it may do so in the summer of 1970. This is a very strange *Milla,* growing in low wet places in thick colonies in grassy pastures. The corms are tiny, and seem to increase rapidly in nature, but they quickly die off before I can get them home after digging while in leaf in Mexico. Out of a hundred or so corms I am lucky to have as many as five survive, and then it takes years to bring them back to maturity. Foliage is grassy and a bright, shiny green. I feel sure that it is a late flowering species and likely flowers in the fall. At long last the prospects for flowering them appear to be very good (at this writing) and perhaps the riddle will be unravelled in another year.

The fall flowering *Milla* species of northern Mexico, *M. rosea* and *M. bryanii* are quite fascinating and quite frustrating. This is especially true of *M. rosea* which may remain dormant and make no effort to grow though remaining in perfectly good condition. Should it decide to grow, it will grow vigorously and quickly erupt from the ground with a rush, thrusting up its whirl of grassy leaves almost overnight. There may be as many as a dozen linear leaves per plant, in contrast to the other species which usually have less than six leaves. The waxy white flowers remain open day and night and have well articulated pedicels. Some have ruffled segments and are indeed very pretty. They need to flower before the first hard freezes as the flowers and buds will be ruined although foliage is unharmed. If *M. rosea* were reliable, it would rank with the very best in the genus, as it is very ornamental and comes at a time when flowers are getting scarce. *Milla bryanii* flowers about a month or so earlier and thus is to be considered a late summer bloomer rather than an autumn flowering species. Under cultivation, *M. bryanii* is more reliable than *M. rosea,* and can be counted on to grow annually. Like *M. rosea,* it has distinctly pediceled flowers in the usual white with green stripes beneath.

Milla bryanii is clearly more closely related to *M. rosea,* than to any other *Milla* species, and were it not for the fact that it flowers earlier, it would be difficult if not almost impossible to separate them. Geography separates them to a certain extent, but not as much as one might think. The state of Coahuila, which is the home of *M. bryanii,* is adjacent to Nuevo Leon, the home of *M. rosea.* As James Giridlian once remarked, ''Flowers don't recognize State lines''. Perhaps the most unusual feature of *M. bryanii* is the hollow leaf, which is like a depressed soda straw in cross section. Many Millas have leaves that are almost, or partially hollow for some of their length, but *M. bryanii* is the only thin leaved *Milla* to carry this to the same extent as does the giant *M. magnifica,* which has terete leaves. The flowers of *M. bryanii* are smaller than those of *M. rosea,* and less attractively marked, but this could be due to their blooming during a much hotter part of the summer. Pigmentation is intensified with cooler days and nights.

Fall blooming Millas are reported from Arizona, New Mexico, and the Texas Big Bend, and these have previously been diagnosed as *M. biflora.* The writer is of the opinion that this *Milla* (or Millas) species is perhaps something else, allied to *M. rosea* and *M. bryanii.* The prospect that we may have a new species north of the Mexican borders still waiting to be described is exciting.

Milla 68-235, is a species from Oaxaca, found in the vicinity of Huahuapan de Leon, and also Yanhuitlan, along the Pan American Highway in northern Oaxaca. This species is almost identical to *M. biflora,* but the entire scape . . . stems, pedicels, tube are minutely bristled. The stamen filaments are slightly longer than those of *M. biflora,* and the scapes are at times apt to be so short as to give them the effect of flowering almost above the ground, as with *Crocus.* The writer was so struck by this odd feature that he was prompted to dub them ''Crocus-Milla'', a name that proved to be a misnomer. Under cultivation the following year, I was horrified to see my ''crocuses'' develop quite tall, normal scapes! For years I had seen these Millas in flower in Mexico in this part of Oaxaca, and for years they had fooled me as being only another version of *M. biflora.* But in 1968 those ultra short scapes completely fooled me, with those unusually large flowers. In 1969 they fooled me again in returning to a taller habit. Apparently those short scapes were due to an environmental situation and nothing more. But it now appears that we do indeed have a new species, as closer inspection has revealed the bristles of the entire scape, as well as other minor differences. There is a very good chance that we have another close ally of *M. biflora,* and that this is likely its southernmost area of penetration. As we approach the City of Oaxaca (in central Oaxaca) they are replaced by a night blooming species of another type. For the time being, it appears that we will have to forget about *Milla* with a *Crocus* habit, although the idea sounded exciting, and appealing. They will have to be tested another year to be certain, as these Millas were grown in a quite shady spot, and being normally sun lovers, the limited sunlight might have forced them to ''stretch'' towards the light, and thus distort their true nature. Even so, no decent *Crocus* would be caught dead doing such an exaggerated ''stretch''!

In summary, we can state that there are several distinctive groups within the genus *Milla*: The nocturnal flowering types which open in the evening and close before day-break, and the day-flowering kinds that open in the warmth of the afternoon and remain open continuously both day and night. The night bloomers are evenly divided between those that form offsets basally, around the mother corm, and those which send out long rhizomes underground away from the mother corm and then form a new corm at its tip. The day blooming group are typified by basally formed offsets, but *Milla* 68-250 is the exception, as it has rhizomes.

We might note that the rhizome-forming habit does not manifest itself until we enter the south-central States of Mexico . . . Puebla, Oaxaca, Chiapas, Guerrero, and Morelos. Apparently The Central Plateau region adheres to the characteristics of *M. biflora* and its day blooming allies. Only in *M. 67-84,* from San Luis Potosi do we find a night bloomer sharing its range with *M. biflora,* but even then they are not found growing together in the same places. Where one species leaves off, it is replaced by another.

Since the vast majority of *Milla* species have white flowers with green stripes on the underside of each segment, we are forced to resort to studying the most subtle characters, such as gross measurements of anatomical parts, presence (or absence) of minute bristles, or denticulate ridges on the leaves, presence or absence of pedicels, etc. Chromosome studies have proved to be most valuable in helping support the gross anatomical differences. What once was a simple genus with but a few species has now become a complex genus with many species.

THE GENERA DANDYA AND BESSERA

The writer approaches the genus *Dandya* with many reservations. What first began as a simple monotypic genus, with only *Dandya purpusii* of Coahuila as its sole representative has now taken on two additional members and has virtually exploded into our faces. At this writing, this author is quite unsure of the ultimate botanical treatment of a small group of little-known members of the *Milla* tribe. Old names, such as *Diphalangium* and *Behria* continue to rear their ugly heads to haunt and taunt. The standing of one of the two known members of the *Bessera* group is once again questioned. The dilemma is far from settled, and the loud bluster of a few well-intentioned botanists . . . is just that . . . bluster. At the risk of alienating some of the vain-glorious (?) authorities, haughtily perched aloft in their secure ivory towers, the writer will present the problem, but will not attempt to finally solve it.

The genus *Bessera* is (or was) composed of two quite different plants. *B. elegans* is far and away the most familiar of the twain; the other is *B. tenuiflora.* It is unnecessary to go into the *B. elegans* morphology in detail, save to say that its most unusual character is the fact that the stamens are joined to one another into a staminal cup or ''trumpet'' of sorts, somewhat suggestive of *Narcissus* (save that Narcissus' cup is not formed by a fusion of stamens) but rather contains the stamens within the cup. As stated above, the staminal-cup of *Bessera elegans* is well-developed, and serves as a eye-appealing part of the architecture of the flower of this species. The little-known species from the tip of Baja California, *B. tenuiflora,* does not have this cup, but instead has a hair-line connection joining the filaments together. These connate filaments are not immediately apparent to the naked eye. Since *B. tenuiflora* has a tubular flower somewhat like *Bravoa geminiflora* (or a penstemon), one must dissect the flower lengthwise in order to expose the staminal bases. Under magnification we find that sure enough, the stamens are indeed connate. On this premise, i.e.—that the connate stamens of *B. tenuiflora* are only greatly reduced rudimentary staminal cups, this species was united with the genus *Bessera,* and the old name of *Behria* discarded as a synonym. This seemed to make sense at the time. Broadly speaking, the connate stamens *Could* conceivably be thought of as a very rudimentary cup.

Meanwhile, the genus *Dandya* was simultaneously elevated to the niche of being a monotypic genus. To be sure, it was noted that *Dandya* was likely closer to *Bessera* than to *Milla,* and it was concluded that *Dandya* must be a very primitive member of the clan, whereas *Milla* was a more modern group on the evolutionary scale. There is yet no reason to think otherwise. But the description of *Dandya* was based on dried material collected early in this century, and while the specimens are still good and the species is a valid one, it is noteworthy to recognize that no one today has ever seen living material. The mountain range habitat of *D. purpusii* is still inaccessible, short of by way of pack animals, just as it was done by Purpus many years ago. The flowers of *D. purpusii* are said to be blue (or bluish) and are rather small. It is not clear if the stamens are connate or not, since this feature is not so easy to determine from the dried material on such smallish flowers, particularly when one must be so careful to preserve the few known existing specimens. The writer feels that there is justification enough to suspect that perhaps these stamens *are* connate. Only the finding of living material can verify if this is so, and this has not happened since October, 1910, when Dr. Purpus collected his specimens on Sierra de la Paila. Is the reader beginning to get the picture? If *Dandya purpusii* does indeed have connate stamens, then how does that affect the genus *Dandya*, with regard to the genus *Bessera?* Or how does that affect *Diphalangium* for that matter? But that is not the end of the puzzle. No, far from it! It is only the beginning.

While poking around southern Mexico, the writer has had the thrill of finding two new members of the *''Dandya-Bessera''* complex. The first one was discovered in Guerrero in 1964, and was given the number *64-74.* At the time, the writer was perplexed. What *was* this strange cormous plant with the strange *shooting-star-like* flowers so much resembling *Dodecatheon* in appearance? Was it an *Allium?* No, it had a corm. Was it *Muilla?* Perhaps, but investigation showed that *Muilla* has reticulated corm-coats, whereas our new plant had fibrous coats, just like *Milla.* Checking a bit further, I decided that perhaps this was the long-lost *Diphalangium graminifolium,* the original herbarium specimen having been destroyed by bombs in its European herbarium in the 2nd World War. It is virtually impossible to retrace *Diphalangium* in any way today, since the description of it was never too clear, and since there is no specimen to refer to. The mystery remained unsolved until 1967, when the writer stumbled across another similar species in southern Michoacan. This one had lavender flowers that were upfacing, rather than pendulous, but otherwise similar to family characteristics of #64-67. It was instantly apparent that this new mauve-colored species was too much like the line drawing of *D. purpusii* made from dried material for the monograph of THE GENUS MILLA AND ITS ALLIES, by H. E. Moore, in *Gentes Herbarium,* Vol. VIII, Fasc. IV, 1953, and illustrated on page 262. Suddenly it all fits together! I had found two new *Dandyas.* But *were* they Dandyas? Or were they Besseras? Dr. Lee Lenz brought this to my attention, pointing out that our new ''Dandyas'' had connate stamens. And if this be so, how could we justify separating them from the genus *Bessera?* I was stunned! That was a good question . . . how *could* we? And to really confirm the dilemma, I finally flowered *Bessera tenuiflora* (at long last) and had a chance to compare its connate structures with those of the two *''Dandyas.''* I was stunned again. The bases of the stamen filaments of *B. tenuiflora* and the two new "*Dandyas*" are much the same! We are thus posed with a set of problems: Should *Bessera elegans* be joined with *Dandya*, thereby making an enlarged, but loosely connected genus *Bessera?* Should *B. tenuiflora* be separated from *Bessera* and placed in the genus *Dandya* . . . or better yet, in the genus *Behria?* Should *Dandya* remain a separate genus, or should it too be re-located in the genus *Behria?*

It is unscientific to day-dream about the many possibilities, tantalizing though they might be. The writer can only give his own humble opinion (and that is all it is . . . an opinion) about the most likely prospects. These are: (1) The genus *Diphalangium,* though officially and perhaps permanently *dead* would likely have contained the plants which we now know as *Dandya.* But having been wiped out by a bomb, this name will forever remain questionable. There is nothing we can do about it, and we will have to accept it. (2) The genus *Bessera,* as we are familiar with it, is a very distinctive plant if confined to *B. elegans.* Its gross morphology is such that it is not apt to be confused with anything else, including the species from Baja California, formerly known as *Behria tenuiflora* Greene, having tubular flowers and connate stamens, but *no cup*! Thus confined, *Bessera* remains a most distinctive genus. (3) The genus *Behria* remains as a monotype, with only *B. tenuiflora* known, and is typified by having tubular flowers and connate stamens. (4) The genus *Dandya,* with three known species, remains, and is typified by flowers that open widely ("starry") and having connate stamens, but having neither tubular form, or a distinct staminal cup. The writer must admit to not having seen the original dried specimens of *Dandya purpusii* (Brandegee) Moore, Gentes Herbarium 1953, but Dr. Lee Lenz has discussed it with me and has compared it with my own lavender flowered *Dandya 67-64,* and has assured me that they are quite different from one another, although he did not elaborate. At any rate, it is a good species for cultivation, and in the 2nd year of culture, the umbels have doubled in number of flowers, so that 20-25 flowers is not uncommon. The flowers open 1-4 at a time over a long period, and a large corm may produce a second scape. The flowers open around mid-day or perhaps before, when the sun hits them, and they expand into lavender stars, with spreading but sometimes reflexed, upfacing blooms. Foliage is very similar to *Bessera,* being narrowly terete, and dark green. This *Dandya* is unusual in having the minute denticulations or "bristles" on the stems and pedicels, that are found in some *Milla* species. The flowers close at night, but may (or may not) reopen the following day. Tentatively this *Dandya* is being called *D. Hannibalii,* in honor of Les Hannibal who was with me when I found it, although all such tentative names are only that, as of this writing—tentative in the most literal sense. The final name-choice will rest with Dr. Lenz.

The other *Dandya,* with the "shooting star" flowers has tentatively been labeled *D. thadhowardii* by Dr. Lenz, but this name will not be final until published. This white flowered *Dandya* is one of the oddest flowered species to be found within the entire family of *Milla* and its allies. The stamens curve to form a ''bird cage'' around the pistil. There is a faint fragrance present, but this is illusive. Under cultivation, this little *Dandya* has proved to be a good bloomer, with largest corms easily producing 20 or more flowers over a period of weeks, from the umbel.

To the amaryllid buff, it really won't matter what the final disposition of *Dandya* will be. They are well worth having, but the existing supplies are so small as to make them almost unobtainable, and then in no significant quantities for garden use. They form offsets slowly and propagation might be more rapid if grown from seed, which they do produce in small amounts.

THE GENUS PETRONYMPHE

Petronymphe is another one of those weird oddities that seems to fit nowhere, although it seems closest to its *Milla* cousins. There is a bit of *Bessera* in it too, as the flowers in the umbels are pendant or nearly so. The color of the flowers is sort of pale yellowish green, and though very lovely and graceful, are inconspicuous. Leaves are nearly triangular in cross section, and remind us somewhat of *Allium triquetrum* in this characteristic. *Petronymphe decora* is the only member of this small genus at present, and Dr. Moore calls them ''Rock-nymphes'', because of their cliff-hanging environment. The writer has spent much time in trying to find them in nature, but has always failed, even though I managed to find the general area (Acahuitzotla, Guerrero) where they hail from.

There you have it. The large cormous family of Mexican amaryllids comprising the genera *Milla, Bessera, Dandya, Petronymphe*, and *Behria.* A complex lot they are, but tantalizing as well. There is still much to be learned about them, although we now know more than ever before. The largest number of species are to be found in the state of Guerrero, and adjacent States of Oaxaca, Michoacan, Morelos, and Mexico. To be sure, other states are represented by either a *Milla,* a *Bessera,* or both. In the northeast, it is *M. rosea* and *M. bryanii.* In the central plateau it is *M. biflora,* with a few *Bessera elegans* in Jalisco and vicinity. In San Luis Potosi City and vicinity we may also find the night blooming 67-84. In Colima and Michoacan we may find the little-understood 65-50 in bloom late in the year. In Puebla we may find at least four species, including *M. biflora.* No doubt many new species are awaiting discovery.

TO BE CONTINUED WITH **ZEPHYRANTHES**, ETC.

IN MEMORIAM—CLAUDE WORTHAM DAVIS, 1894-1969

Teacher, researcher, soldier, scholar and, above, all, a kind, Christian gentleman and an unselfish friend who was more interested in giving than in getting, Claude W. Davis died March 23, 1969 in Baton Rouge, Louisiana, at the age of 74. Born November 23, 1894 in Delhi, La., he grew up there and attended schools in Louisiana including Louisiana Tech., and Louisiana State University where he received both the B.S. and M.S. degrees. Although soldiery appeared completely out of character for him, he served his country in World War I as a lieutenant; and in World War II as a major, and a specialist in agriculture in England, North Africa, Italy, France and Germany. He retired from Louisiana State University in 1955 as Professor emeritus of agricultural extension education after spending 35 years in service to Louisiana agriculture.

This was his profession but his avocation, which he pursued intensely, was the growing and hybridizing of daylilies, *Amaryllis* (see Fig. 26, page 98, PLANT LIFE, 1960) and *Iris,* both Louisiana and bearded. Many of his daylilies and Louisiana iris were registered and eagerly sought by enthusiasts in these fields. Also, he grew roses to a perfection that was envied by all who saw them. Many visits with Prof. Davis to buy a few amaryllis resulted in a return home with an armful of ''free goodies'' in addition. Not only did he share his creations with others, but his enthusiasm encouraged others to participate in these creative endeavors. Prof. Davis will be sorely missed by the many friends who knew and loved him and by a world left richer because he had been here.—*Fred Buchmann*

1969 HERBERT MEDAL PRESENTATION TO W. QUINN BUCK

ED PENCALL, *Vice President, Southern California Hemerocallis and Amaryllis Society*

The regular meeting of the Southern California Hemerocallis and Amaryllis Society on June 21, 1969, was made the occasion for the presentation of the 1969 HERBERT MEDAL to W. Quinn Buck. Mrs. George Marshall, member of the board of trustees of the California Arboretum Foundation, Sponsors of the Los Angeles State and County Arboretum, and an active leader in the Southern California Horticultural Institute, made the presentation.

After reading the official citation from Dr. Hamilton P. Traub acting for the American Plant Life Society, Mrs. Marshall outlined the horticultural accomplishments of the year's HERBERT MEDALIST. She then briefly sketched the contributions of previous HERBERT MEDAL recipients. All present felt Mr. Buck a worthy addition to their ranks.

Members of the Southern California Hemerocallis and Amaryllis Society presented Mr. Buck with a fine Bulova watch for his constant contributions to the Society as general factotum and adviser. He in turn presented each guest and member a ramet of his *Hemerocallis* clone 'Gold Antique'.

Mr. Buck also was speaker for the meeting, and he outlined his first interest in plants, his introduction to colchicine, and his work in hybridizing and polyploidizing plants. His long discussion of the use of colchicine, particularly with the *Hemerocallis,* was clear and understandable as he showed how to use the mutagen, what results could be hoped for, and what accomplishments had been made.

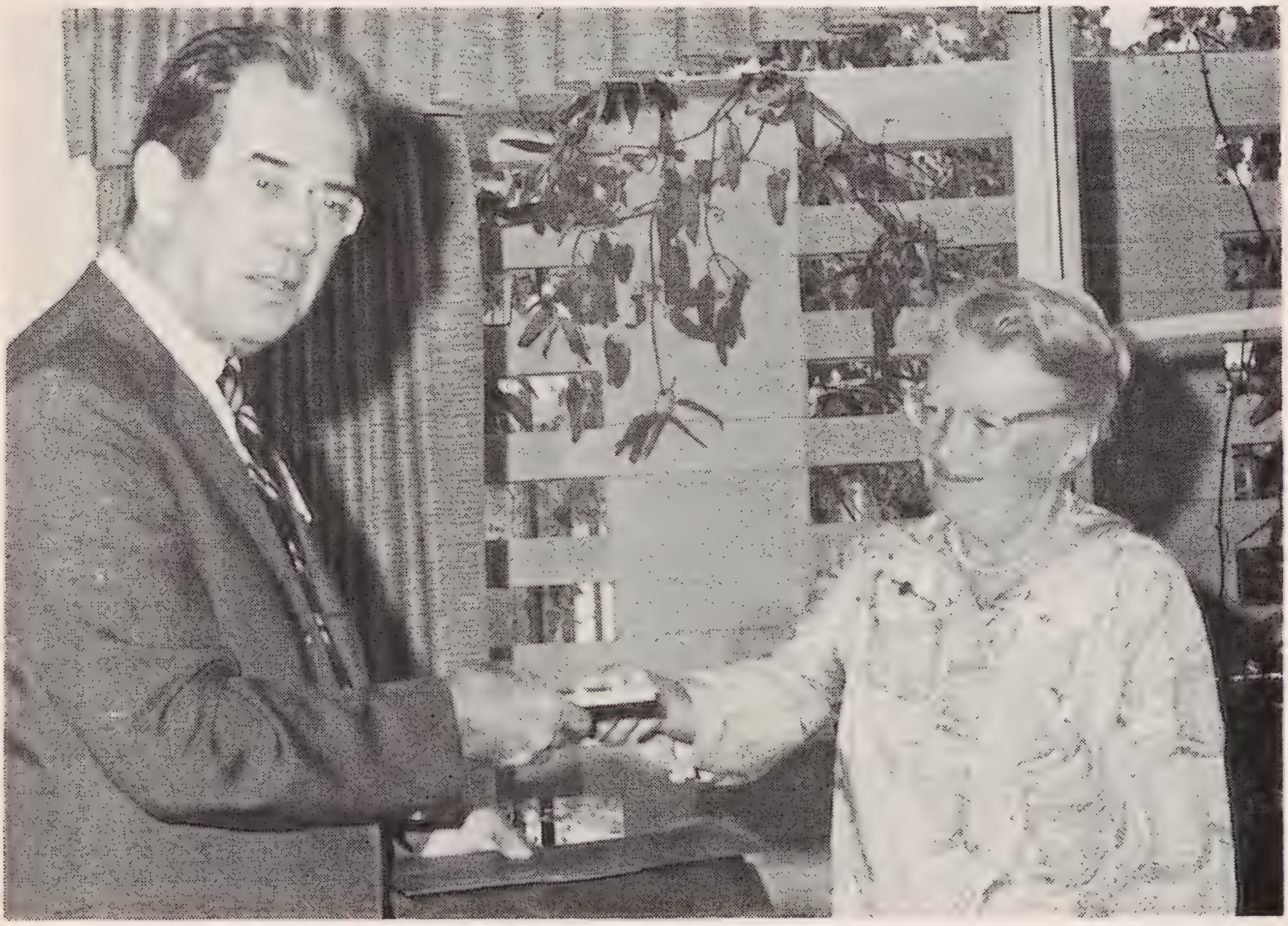

Fig. 4. Mrs. George Marshall is shown presenting the 1969 HERBERT MEDAL to W. Quinn Buck in award ceremonies held in the Seminar Room at the Los Angeles State and County Arboretum, Arcadia, Calif., on June 21, 1969. Photo by Lance Reuther.

This gala meeting lingers in the memories of those who were present, and we look forward hopefully to other such occasions for our group.

EDITOR'S MAIL BAG

Your editor has moved into his new home nearer to the University of California campus in the Toorey Pines region in order to take advantage of the new research Library. He still has the task of moving the thousands of bulbs. The new address is 2678 Prestwick Court, La Jolla, Calif. 92037.

We regret to announce that Mrs. W. E. McArthur, of Jacksonville, Florida, one of the pioneers in the popularization of the amaryllids, died suddenly, June 2, 1969 at the age of 90 years. An In Memoriam note will appear in the 1971 PLANT LIFE. Under date of March 29, 1969, Mrs. Arthur had written with reference to PLANT LIFE and the AMARYLLIS YEAR BOOK, "I have always enjoyed and profited by the wonderful articles written for this unique magazine and noted the growing knowledge and improvement of *Hemerocallis* and other amaryllids. I miss the bulb articles written by Mr. Hayward; have not seen or heard from him lately; for reason the penalties of age have curtailed my activities."

Under date of October 29, 1969, Wyndham Hayward writes,—"I have finally moved out of my house at 915 South Lakemont Avenue, Winter Park, Florida into my trailer home 1 mile south of Goldenrod. My address will be *7459 Restful Street, Orlando, Florida 32807.*"

In 1969, Mr. James E. Mahan, your Secretary of the National Amaryllis Judges Council, and your Registrar of Amaryllid Names, has been welcomed into the ranks of *Patron Life Members* by contributing $500 or more to the Society for the advancement of the amaryllids.

PLANT LIFE LIBRARY—continued from page 5.

FLORA EUROPAEA. VOLUME 2. ROSACEAE TO UMBELLIFERAE. Edited by T. G. Tutin, V. H. Heywood, N. A. Burges, D. M. Moore, D. H. Valentine, S. M. Walters and D. A. Webb. Cambridge University Press, 32 E. 57th St., New York, N. Y. 10022. 1969. Pp. xxvii + 455; 5 maps. $23.50. **Flora Europaea** is sponsored by the Linnean Society of London. The Editorial Committee is based in the British Isles and is supported by Advisory Editors and Regional Advisors from all over Europe. It is a projected four volume work in which the national and regional floras of Europe are to be synthesized for the first time. Volume **one** was published in 1964, and now volume **two** has appeared in 1969, and it measures up to the high standard set in the initial volume. The work is arranged according to the Engler system except that the Monocotyledons have been placed at the end.

After the **Preface** and the informative **Introduction**, there follow lists of basic and standard floras; synopsis of families **Roseceae** through **Umbelliferae** included in Volume 2; key to the families of Angispermae; explanatory notes on the text; detailed descriptions of families, subfamilies, genera and species. Available evidence from morphology, geography, ecology and cyto-genetics has been taken into consideration in delimiting the species and subspecies. The volume is completed with the four appendices; key to the abbreviations of authors names, titles of books, periodicals, and anonymous works, cited in the text; glossary of technical terms; an index; and five maps.

The editors and collaborators are to be congratulated on producing such an outstanding example of effective international cooperation in giving to the world this reliable and exceedingly useful work. It is very highly recommended to all interested in the most recent information about European vascular plants, including the professional plant scientist, the student of botany, and the amateur plantsman.

THE RIBOSOME, by A. S. Spirin and L. P. Gavrilova. Molecular Biology, Biochemistry & Biophysics Volume 4. Springer-Verlag, 175 5th Av., New York, N. Y. 10010. 1969. Pp. 161. Illus. $14.90. We are indebted to the Russian authors for this concise monograph which has its purpose "to formulate more or less generalized representations of the structure and function of the ribosome as we envision it at the present day. After an informative introduction dealing with the general scheme of protein synthesis, coding of information (the genetic code), storage and replication of the coded information, transfer of information, involvement of amino-acids in protein synthesis and synthesis of protein on the ribosome, the detailed discussion of the subject matter is grouped under two headings. Part 1 is concerned with the structure of the ribosome, and Part 2, with the functioning of the ribosome. The volume is completed with an ample bibliography and a subject index. This stimulating book is indispensable to all biologists, and is very highly recommended.

HORTUS CLIFFORTIANUS, by Carl Linnaeus. Folio. Amsterdam 1737 [1738]. Pp. [xxiv], x, iv, + 502 [16] + 36 plates. Facsimile Reprint, Verlag von J. Cramer, Postfach 48, Lehre, Germany. The reprinting of this early work is an important event. The main part of the book (pages 1 through 502) is devoted to a catalog of the plants in the Cliffort garden, arranged according to Linnaeus' **Genera Plantarum.** European as well as non-European plants are enumerated. Since this work pre-dates Linnaeus' **Species Plantarum** (1753), and the entries are cited in the later work, it is obvious that **Hortus Cliffortianus** is required in the interpretation of the species concerned.

The original folio volume is the most impressive of Linnaeus' works both in typography and the fine copper plate engravings. In addition to the baroque frontispiece by Wandelaar, there are 35 plates by Ehret and/or Wandelaar. The first two illustrate leaf forms, the rest portray plant species. These drawings are notable for the floral details, and they foreshadow the later period of botanical illustration that lasted to the middle of the 19th century. Verlag Cramer is to be complimented on reproducing the original work faithfully on high quality paper and in an excellent, durable cloth binding. It is a volume both for the collector of fine books and the active worker in plant science. All taxonomists should avail themselves of this opportunity to acquire this necessary work for ready reference. Very highly recommended.

RELIQUIAE BALDWINIANAE, compiled by William Darlington. Facsimile of the 1843 Edition. Introduction by Joseph Ewan. Four indices—of persons, plant names, etc. appended. Hafner Publ. Co., 31 E. 10th St., New York, N. Y. 10003. 1968. Pp. 347. Illus. $12.50. Subtitled, "Selections from the correspondence of the Late William Baldwin, M. D., Surgeon in the U. S. Navy", this is the biography of the short-lived Dr. Baldwin, who was endowed with a keen analytical mind and thorough painstaking habits. He traveled widely in the Carolinas, Georgia and Florida, and his letters, expertly edited by Darlington, furnish an interesting commentary on the botanical events, discoveries, personalities, places and frustrations of an era long past. We are indebted to the publishers for making available to us this valuable reconstruction of the past since only a limited number of copies were originally distributed. Very highly recommended.

PLANT LIFE LIBRARY—continued on page 48.

1. REGIONAL ACTIVITY AND EXHIBITIONS

THE 1969 AMARYLLIS SHOWS

The Amaryllis Shows began in the latter part of March with the Corpus Christi Official Amaryllis Show, March 21, 22 and 23. Then followed the Official Amaryllis Show of the Greater New Orleans Area, April 12 and 13; the 1969 Houston Amaryllis Society Official Amaryllis Show, April 13; the Greater Houston Official Amaryllis Show on April 20; and the Southern California Official Amaryllis Show at Arcadia, California, on April 26 and 27. The Baton Rouge Amaryllis Garden Tour was held on April 27 in place of the regular show. No reports were received from Hattiesburg and Mobile.

CORPUS CHRISTI OFFICIAL AMARYLLIS SHOW, 1969

MRS. CARL C. HENNY, *Schedule Chairman,*
Corpus Christi, Texas 78404

The Coastal Bend Amaryllis Society held its tenth annual Exhibit in conjunction with the Lola Forrester Flower Show in our Coliseum, on March 21st, 22nd and 23rd of this year. Weather conditions and an early date for our show prevented us from having a large number of amaryllis in bloom for our display.

Our ''Pot Grown'' section was very small, due to the Longshoreman's Strike, which prevented our members from receiving the amaryllis bulbs they had ordered from Ludwig and Co., Holland. Mrs. Carl Henny was fortunate in having 'Daintiness' (pot grown) in bloom, which scored 97 points, for which she received the Ludwig Challenge Trophy and an Award of Merit. Mrs. R. A. Hornberger received a ''Special Achievement Award'' for her 'Apple Blossom' cut scape, which scored 95 points. Mr. R. L. Retallack and Mr. W. M. Neyland received blue ribbons for their entries.

Mrs. Carl Henny also received a ''Special Trophy'' for receiving the greatest number of blue ribbons for her entries in the ''Breeder's Class''. The American Plant Life Society Award of Merit was given to Mrs. Henny and Mrs. Hornberger for their entries of 'Daintiness' and 'Apple Blossom'.

Non-Members receiving blue ribbons were Mrs. Guy Coffee, Mrs. Earl Jones, and Mrs. C. H. Van Scoy. A total of 12 blue ribbons, 5 red ribbons, and 2 gold ribbons were awarded for specimens displayed within our exhibit.

Mrs. Edward T. Story, Mrs. Larry Miller, and Mrs. R. H. Parkinson, National Accredited Amaryllis Judges from San Antonio, Texas, served as judges for our Exhibit.

1969 GREATER NEW ORLEANS OFFICIAL AMARYLLIS SHOW

DR. TIM CALAMARI, JR.
1016 Rosa Ave., Metairie, La. 70005

Over eight hundred people viewed the 1969 Official Amaryllis Show held over the week-end of April 12th and 13th at the Lakeside Shopping Center Mall. Everyone was well pleased with the show location and the amaryllis display. This was the second year that the Garden Circle Amaryllis Club and the Men's Amaryllis Club of New Orleans joined together to sponsor a combined show. Mrs. W. J. Perrin was chairman of the Artistic Design section and Dr. Tim Calamari, Jr. chairman of Horticulture.

The Garden Circle handled the Artistic Design Section of the show which consisted of thirty-two invitational entries featuring amaryllis. Tri-color winner in the Artistic Design Division was Mrs. Gordon Morris. Winner in the Creativity Division was Mrs. William D. Grace. Silver trays were presented to both winners.

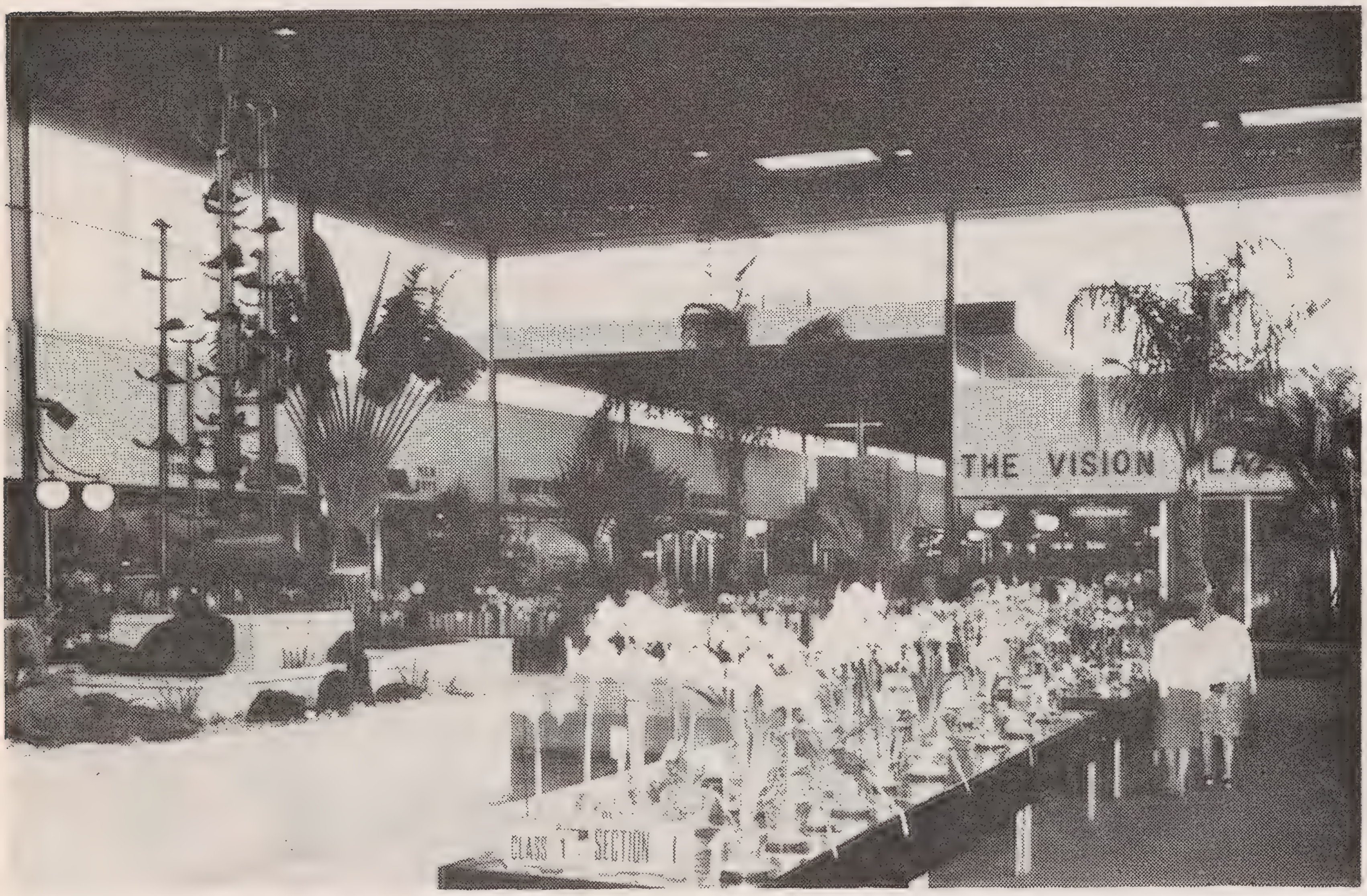

Figure 5. 1969 Greater New Orleans Amaryllis Show. Part of Exhibits.

The Men's Amaryllis Club sponsored the Horticulture Section in which over two hundred and sixty entries were made, with almost one hundred and sixty being pot plants. Milo Virgin and Albert Diermayer won top honors in the Horticulture Section. Mr. Virgin won the sweep-

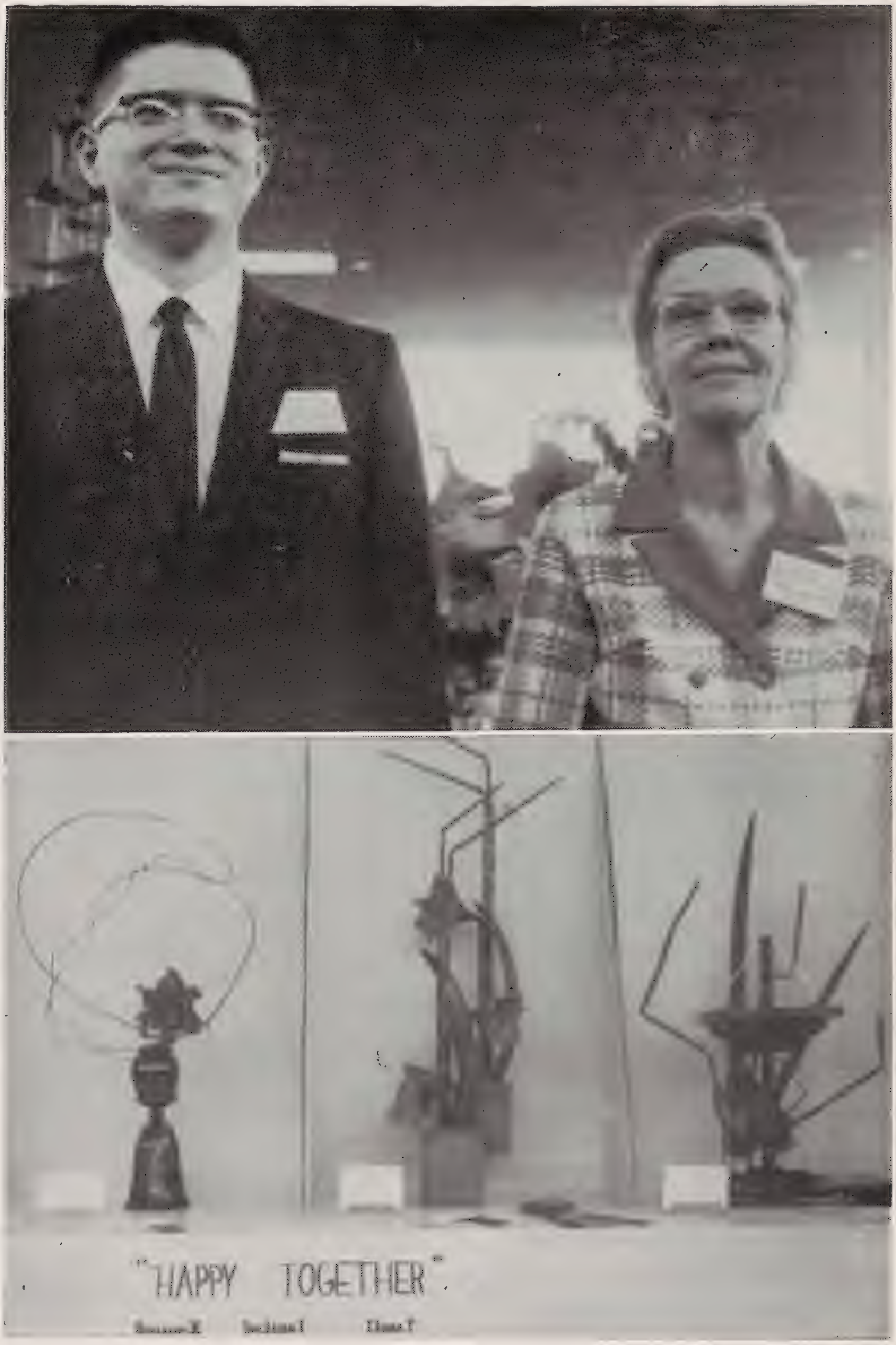

Fig. 6. 1969 Greater New Orleans Amaryllis Show. Upper, Dr. Tim Calamari, Jr., Chairman, Horticulture Section; and Mrs. W. J. Perrin, Chairman, Artistic Design Section. *Lower,* part of exhibits, Artistic Design Section.

stakes ribbon for the most blue ribbons in the registered hybrid section, Ludwig Cup for the best Ludwig specimen (a Picotee Red Lining), the Swetman Trophy for the most blue ribbons overall, and the President's Trophy for the most blue ribbons won by a member of the Men's Amaryllis Club of New Orleans. Al Diermayer won the sweepstakes ribbon in the non-registered hybrid section, the Latapie Trophy for the best registered specimen (a 'Maria Callas'), the Mahan Award for the second best registered specimen ('Flamboyant'), and the Clements Trophy for the best non-registered specimen. Miss Ann Weed was winner of the Southern Seed and Popcorn Company Trophy for the best specimen in the breeder's class. Vincent Peuler won the Edward F. Authement Memorial Trophy for the second best non-registered specimen. Florence Autry received the Reuter Seed Company Award for the best cut specimen (an outstanding *A. johnsonii*). Dr. Tim Calamari, Jr. won a special trophy for the best single floret ('Margaret Rose'). Amaryllis Society Awards went to Al Diermayer, Milo Virgin, Ann Weed and W. J. Perrin.

Perhaps the most impressive and memorable aspect of the show was the enthusiastic and genuine cooperation between the members of both clubs in the planning, staging and dismantling. Most everyone who viewed the show agreed that this cooperation resulted in an amaryllis show which was in every respect a real success.

1969 HOUSTON AMARYLLIS SOCIETY OFFICIAL SHOW

Mrs. A. C. Pickard, *Show Standards Chairman,*
1702 North Blvd., Houston, Texas 77006

The Houston Amaryllis Society Show on April 13, 1969 has passed into history. The 1969 season was one well worth noting. Old man weather paid us a visit in February with warm spring sunshine. But, through March the season was marred by cold, wet weather which resulted in short scapes and injured blooms. However, we discovered that this same phenomenon existed over the entire area.

The ''poor Amaryllis season'' everyone talked about still produced myriads of flowers and many beautiful show specimens. A section presenting the professional arrangements as a distinctive entry (not in competition with the horticulture division) and special educational exhibits have developed a growing interest in the dazzling beauty of today's modern arrangements.

In competitive horticulture, the Amaryllis Judges awarded the American Plant Life Society awards of Merit to Mrs. Tracy Word, Mrs. Ward Blair, and Mrs. A. F. Lagatski. Dr. E. M. Yeats received preliminary commendations for seedlings.

GREATER HOUSTON OFFICIAL AMARYLLIS SHOW, 1969

MRS. SALLY FOX,
1527 Castle Court, Houston, Texas 77006

Colorama—Could there be a better way to describe the brightness of the amaryllis? Color was splashed throughout the Houston Garden Center where hundreds of visitors viewed the Greater Houston Amaryllis Club's Sixth show on Sunday, April 20, 1969.

The "Color Splash" was immediately brought to the attention of the visitors by three huge six foot artist's palettes on the main stage and entrance of the Center. The Staging Committee headed by Mrs. C. R. Mercer with Mrs. Chas. H. Pease and Mrs. Glen Melton, cleverly substituted mammoth colorful amaryllis for the paint pots, making a very effective display.

Mrs. W. S. Wheeler, Entries Chairman said she was very pleased that the members brought in such a nice assortment of specimens, with so many different amaryllid family specimens to show, such as clivias, various doubles and species.

Again this year there were many seedlings entered and competition was keen for A Preliminary Commendation given by the American Amaryllis Society, affiliated with the American Plant Life Society. The novice hybridizers are not only developing beautiful blossoms, but a hardier stock by crossing the Dutch and amaryllis from other countries with some of our better American strains. These crosses are better conditioned to combat the problems that some of us have with the Dutch bulbs that are overly forced and produce well only the first year.

Also, the Invitational Section had outstanding entries. Mr. Randolph Lorio won the silver trophy with an almost faultless four blossom specimen and was delighted to learn the silver dish was a permanent possession.

Despite the color on the display tables, visitors were drawn to the trophy table to view the top winners, as follows:

Mrs. Sally Fox won the Greater Houston Amaryllis Club silver tray for an outstanding specimen 'Beacon' which had five open florets. Mrs. Anna Heesche's 'Trixie' won the Ludwig Challenge Cup. Mrs. Clint R. Black was presented a silver covered dish for 'Sparkling Gem', a miniature. All of the above were presented with Award of Merit from the American Amaryllis Society. Mrs. John Ellett had the best American specimen in the show and won a silver dish.

Mrs. R. A. Fawcett's large rose shaded seedling of Dutch parentage won a silver shell. She was presented a Preliminary Commendation Award from the American Amaryllis Society. Mr. Kermit L. Warnasch won a silver tray for Sweepstakes with ten blue ribbons. All classes were judged by official amaryllis judges selected by Chairman, Mrs. Clint R. Black.

The Educational Exhibit consisted of methods of propagation from seed to clone; and vegetative reproduction. This section was capably handled by Mr. Kermit L. Warnasch who answered many questions to interested visitors.

Mrs. W. J. Snow acted as Arrangements Chairman and commented on how many ways the members used amaryllis to make outstanding arrangements. These were not judged and merely added beauty and color to the show. Mrs. John Ellett is President of the Greater Houston Amaryllis Club. She assisted the Show Chairman, Mrs. Sally Fox, and both felt this was an outstanding show with goal fulfilled—''promoting interest in growing amaryllis''. Color lovers—Amaryllis lovers—A great Synonym!

SOUTHERN CALIFORNIA OFFICIAL AMARYLLIS SHOW, 1969

JOE WERLING, *Show Chairman,*
5139 Hermosa Av., Los Angeles, California 90041

Our show was held at the Los Angeles County and State Arboretum on April 26 and 27, located at 301 N. Baldwin Ave., Arcadia, California. The theme this year was ''Fantasy in Flowers.''

The great majority of exhibitors grow amaryllis in the open ground. So many of us spent many spare hours ''coaxing'' our bulbs to send up their flower scapes in proper time to make the show dates. With our combined efforts we searched all over Southern California to have enough flowers to make a good showing. We certainly did not have an abundance of flowers, but as the ''show must go on'' we hope that in our own small way we may have provided encouragement for others to participate in our next year's show. Considering weather and availability of flowers our show was a very presentable display.

Now to the awards: Sweepstakes—S. S. Harsbarger; Runner-up—V. R. Fesmire; Best Gracilis—S. S. Harbarger; Best Seedling (hybridizer's class)—Quinn Buck; Runner-up—Mrs. Scott; Popularity Poll Winner—Dr. Martha Kohl; Special Award for species—L. Doran; Special Award for vase of cut flowers—Dr. Martha Kohl—probably a Richard Diener hybrid; Special Award for cut flowers—E. A. Angell.

The jewels of our exhibition were a collection several species from South America by J. Leonard Doran, 1117 N. Beachwood Dr., Burbank, California. Following is a brief description: First, a No. 52—*A. belladonna* collected in Pucayaca, Peru. It was a rose tone which is unique for *A. belladonna;* Secondly, *A. pardina,* spotted, collected in Bolivia; Third, unidentified species (?) collected at Caragutatuba, Brazil—a flaming orange; Fourth, *A. flammigera* collected in Argentina; Fifth, *A. reginae,* a bright red flower, unknown, was collected in the mountains in the western part of Espirito, Santos, Brazil.

Ed Pencall's seedlings in the large containers made a spectacular display.

The certified judges that served for this show were Polly Anderson, Roger Fesmire, Quinn Buck, Eva Turnquist, Gladys Williams and Jack McCaskill.

We are indebted to the following members who so graciously worked long hours making our show a success: Mr. & Mrs. Harshbarger, Eva Turnquist, Mr. & Mrs. Roger Fesmire, I. K. Rosoff, August Phillips, Ed Pencall, John Vosburg, Irma & Joe Werling, Dr. Spearman, the Cochrans, the Dorans and Mrs. Welbourne. Also, we want to congratulate Quinn Buck for receiving the William Herbert Medal for 1969. This award was given for his outstanding contributions in amaryllis and tetraploid daylilies hybridizing.

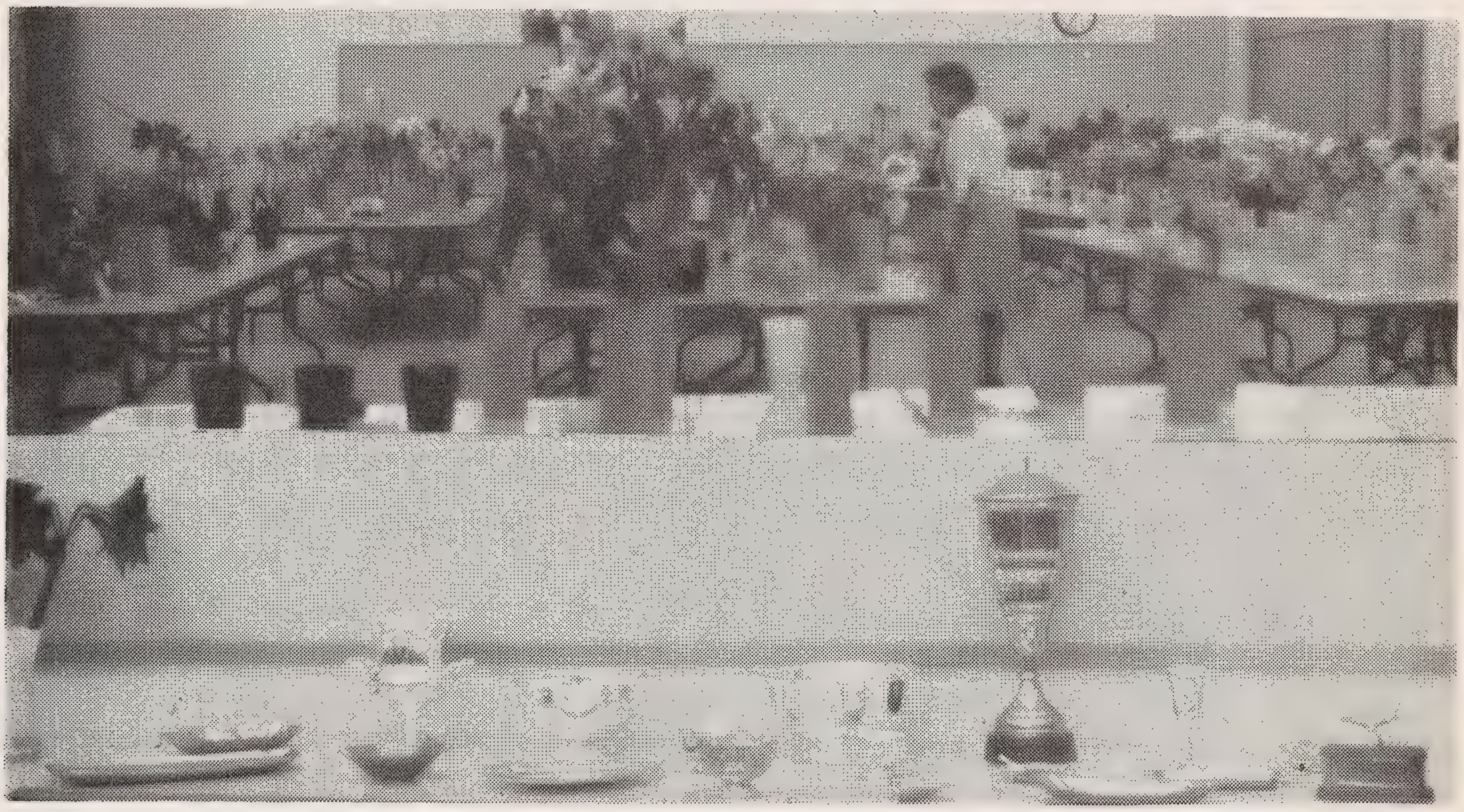

Fig. 7. 1969 Southern California Amaryllis Show. Upper, part of exhibits; and *Lower,* trophies awarded at the show. Photo by Jack McCaskill.

1969 BATON ROUGE AMARYLLIS GARDEN TOUR

FRED BUCHMANN, *1766 Avondale Drive,*
Baton Rouge, Louisiana 70808

For 1969 the Baton Rouge Amaryllis Society decided not to have an official show but to have a garden tour instead. On Sunday afternoon, April 27, the gardens on tour were at the homes of Mrs. T. K. McKnight who has many thousands of large-flowered hybrid *Amaryllis* seedlings growing outdoors; Mr. and Mrs. Ed Beckham who have many seedlings and also most of the recent Dutch introductions growing both outdoors and in a greenhouse; and Mr. and Mrs. Fred Buchmann where species hybridizing has been emphasized. While considerable informal visiting takes place among several members of the group, this was an occasion when all members could visit and discuss conditions of culture, methods of propagation, hybridizing theories and objectives in hybridizing. The tour was leisurely, informal and enjoyed by all. A great many more interesting flowers were viewed than at a show where only those specimens in near perfect condition are on display.

GUIDELINES FOR OFFICIAL AMARYLLIS SHOWS

Mrs. A. C. Pickard, *Houston, Texas*
Amaryllis Instructor for Judging Schools

By growing, knowing, showing and sharing through flower shows, we add to the beautification and human relationships in the dynamic growth of our communities and its therapeutic value. These shows are attended by an enthusiastic public to obtain education in horticulture.

In order to insure the further growth of this movement, much time and thought will have to be devoted to the organization and improvement of many of the individual shows. The fundamental purpose of an exhibit is to acquaint Mr. Stranger with the plant family and to intrigue him into growing plants himself. We often fail to get the fullest joys from our plants simply because we do not know how to truly share our interests and enthusiasm with others. But, you cannot do the job properly without intelligent preparation.

What makes a good Society? Maybe it is a real good President. Maybe it is a good board of Officers. Maybe it is the fact that we sponsor the prettiest flower show in the widest range of color you have ever seen. You may have all of these things, but if you do not have enthusiastic members, you do not progress.

Appointment of Committees: The first step in flower show preparation is the appointment of the general committee by the President of the organization sponsoring the show. This General Committee serves as the nucleus that directs the multiple activities of planning and staging a show. The individual selected as Chairman should be energetic, diplomatic, dependable, and have executive ability and general knowledge of the organization.

The Schedule: Within the limits prescribed by the A.A.S. Show rules, the schedule is the law of the show. Yet, so many schedules are silent on so many important points that bitter arguments and misunderstandings frequently arise. Unfortunately, many committees write their current schedule simply by copying the one used last year, which in turn was a duplicate of the one used the year before. Or copy from some sister organization that created potential problems obviously problems for one show will not necessarily be the same for all others.

The filing of the schedule with the chairman is a necessary first step for approval. Each show schedule must provide for horticultural sections of all 9 divisions of registered Amaryllis cultivars. Cut specimens and pot plants set up in their respective classes. Sections and classes for non registered plants. The show schedule should provide for the following divisions: seedlings, educational, artistic, junior, corsage classes. Collection classes are encouraged. Commercial exhibits or displays may be entered in the Commercial Division. The local show committee is the final judge as to the commercial status of a grower. Most commercial growers prefer not to compete because of the ethics of the Society. Shows which limit competition in the horticultural division to amateurs should provide the opportunity for the commercial grower to be awarded special awards.

Because of the added attraction and artistic value, plant society shows welcome entries by arrangers. An Amaryllis must be used in all arrangements for competition. Some shows get along very well without limiting competition regardless of whether they are professional or trained amateurs. But, often it is desirable in the schedule to provide special classes for advanced or members of expert groups with appropriate definitions as to the status of *Novice, Amateur* or *Advanced Amateur.*

Art and Craft Exhibit is a fairly new feature designed to stimulate more interest in the use of Amaryllis. Some suggestions to work with in this category are oils, water colors, dry brush, etc. These can be done in any form or design in which the Amaryllis flower is recognizable. Space allotted to each group will depend on the type and interest expressed. Participation in this exhibit open to A.A.S. members and separate class for non-members. So, don't withhold your talents.

Corsage Class: Because of needed flexibility to meet the demands of progress in shows, appropriate corsages can be made from almost any Amaryllis flower. Miniature Amaryllis flowers predominating gain distinction and individuality through skillful handling of material selected. The following suggested classes are adaptable for Amaryllis shows: (1) Corsage, open class, no specified occasion or costume. Fresh Amaryllis flower predominating; (2) Corsage: A. Tailored B. Informal C. Formal.

A corsage is judged according to the same elements and principles of design as are applied to all other arts. Such a class may be provided "For Exhibit Only" by members of the society to add beauty and prestige to the show.

Some societies support a Junior division, others do not. Its use is approved only by using the same rules as those approved by the sponsoring society. The division may be sub-divided into age groups and all exhibits in the horticultural division must have been grown by the exhibitor whose name appears on the entry card.

Educational Exhibit: The educational committee should be prepared to undertake this task. The separate displays need only specific differences involved in hybridizing Amaryllis.

(1) Insect or self pollination and plants resulting from hand pollinated seed. The display should be labeled H.P. and if pollen from the same plant (self), if from a sister seedling, (sib).

(2) Display methods of propagation showing life cycle of Amaryllis from seed to clone with parent and offspring.

(3) Vegetative or Asexual propagation. This term applied to the propagation of the plant from parts other than seeds and the plants reproduced possesses exactly the same characteristics as the parent plant. Methods of display and demonstration are: A. Cuttage of bulb into many sections; B. Scoring the basal plate; C. Scooping the center.

Educational exhibits should be in an area where people may mingle, discuss and study them.

The most successful show depends a great deal on the personal touch of the members. Extend the welcome hand to a prospective member by including in the schedule the Invitational Classes. Shows are the best method of interesting newcomers and present the fascinating activities of growing beautiful Amaryllis.

We have found Amaryllis lovers drive great distances every year from the far corners of our State and adjacent states. They come with note books and jot down varieties they like. Many who visit shows are aged or are apartment dwellers, having no need to grow the plant but come merely to visually enjoy the beautiful flowers since their circumstances restrict their growing. To inspire and educate such ambitious spectators is bound to have a long range effect upon the beauty of your community.

Distribute copies of the schedule as far ahead of the growing season as possible. Explanation of some of the terms used in the schedule are necessary for proper interpretation. By providing programs in cultural practices far in advance, members will be encouraged and better prepared to stage a first class show.

Show time: It's show time and entry day is near. Many people will have the fun of winning the Award of Merit including blue ribbons. This pleasure will be fourfold. Not for the prizes won, but for the joy of growing, knowing, showing and sharing.

Lucky is the gardener whose garden peaks at show time. Timing that one prize bloom for the show is a gamble. All of us have seen great beauties come on too early or bloom too late for the show. Nothing can be done about Old Man Weather but some caution can be taken by planting bulbs at different dates or if garden grown bulbs are planted in different locations. Refrigeration can be used to great advantage to hold back buds for a week or more. They should be cut just before the floret opens, wrapped gently and placed carefully in the refrigerator with temperature not to exceed 50 degrees. Remove about three days prior to the show, wrap the end of the scape with a rubber band in order to hold the length of scape and place in 2 to 3 inches of water in a container sufficient in height to hold the scape erect. Bring the specimen gradually to light in a warm room to expand the florets.

Warm temperature hastens blooms and cool temperature will retard. If you decide to enter the specimen just the day before, cut your specimens early in the morning. Select specimens in prime stage of development. It is worthwhile one week before show time to spot potential entries. If the bottom of scapes are cut straight across, it will help keep the scape upright. If wide mouth bottles are used, a wad of florist clay may be used to hold the scape in an upright position.

Exhibit the potted specimen in a clean unadorned pot—clay pot preferred. Do not wrap with foil as the brightness detracts from the flower color. Stakes are permissible if necessary to hold the scape. No deduction if not discernible. The removal of anthers is allowable and no deduction made for doing so if so stated in the schedule.

It is better to remove all spent florets and scape from the plant as they detract from the open florets. Remove any residue from the foliage. Grooming of the specimen is entirely up to the exhibitor. Amaryllis flowers must stretch for a few hours after opening to attain full size. If this much time has not elapsed the flower will look stiff and not fully matured.

Labeling Entries: Encourage exhibitors to label adequately using Registration number, name and division if possible. Labeling should be done well in advance of the show date and should be large enough to insure visibility. This will remain until the specimen is entered in the show and transferred to entry card placed with specimen. Advise beginners how to transport entries by giving suggestions. Carry specimens in tip proof containers. A small amount of water will keep specimens fresh. Leave plenty of room between exhibits to prevent damage. Protect florets from wind and weather. Label all specimens with your name. Write legibly in case someone is helping you get your entries in place. It is a time saver. The person exhibiting should arrive at the show place in ample time to get his entries through classification and entry channels before the last minute deadline.

How about Trophies? We know that exhibitors make the show and to encourage them the necessary bait—Trophies. They are donated by membership and friends. One of a plant lovers most heart warming experiences is to find the judges have included his plant among the awards.

Classification and Placement: With the schedule, classification and placement go hand in hand. Rapid and efficient placement can be the most important part in getting the show on the road for judging. There will always be problems in classifying and placing and a tremendous amount of information must be completed before the show is opened to the public.

Complete final duties as part of the horticulture committee by eliminating classes in which no entries were received and rearrange the tables in order to use the voids to create a more pleasing over all look. There is no way of knowing in advance how much table space to allocate for each class. Classes may be combined or further divided in the interest of adequate or better judging. Now the entries are accurately classified and ready for the Amaryllis official judges.

After the awards are made, the clerks can attach the ribbons to the entry cards. Hostesses should serve in shifts in each section of the show. They give information, answer questions and lead conversations to educate people about Amaryllis. The Hostesses police the show and guard the property of the exhibitors.

The Publicity Committee: The Publicity Committee's work should begin long before the opening of the show by submitting publications to the newspapers. Immediately following the show, obtain the results and give a brief story including outstanding exhibits. Award winners should be mentioned, giving names. Announce names of the Judges after the show, never before.

Grow as many Amaryllis as you can, learn as much about their culture as possible, join the Plant Society where more information is available, and above all have fun growing and showing Amaryllis.

PLANT LIFE LIBRARY—continued from page 36.

RHODODENDRONS AND AZALEAS, by the Sunset Editors. Lane Books, Menlo Park, Calif. 94025. 1969. Pp. 80. Illus. $1.95. This profusely illustrated, easy to read complete guide to the selection and growing of Rhododendrons and Azaleas will be welcomed. The topics discussed include "Meet the Rhododendron clan"; how Rhododendrons and Azaleas grow; requirements for success; trouble shooting your plants' problems; their use in the landscape; container plants; guiding your plants' development; propagation; shopping for the plants, and Index. Highly recommended to all gardeners.

BRITISH MOSSES AND LIVERWORTS. 2nd ed., by E. Vernon Watson. Cambridge University Press, 32 E. 57th St., New York, N. Y. 10022. 1968. Pp. 495. Illus. $13.00. This second edition of a standard reference work will be welcomed. Full descriptions and ecological details of over 200 of the common or more notable species are illustrated to show the diagnostic microscopic and macroscopic features, and also brief notes on many other species are given. An introduction to the general characteristics of the bryophytes, and the simple terminology, make it possible for the beginner to use the book. The keys and habitat lists will be invaluable to the beginner and the specialist. Very highly recommended to all interested in the mosses and liverworts.

THE PHYSIOLOGICAL ASPECTS OF PHOTOSYNTHESIS, by O. V. S. Heath. Stanford University Press, Stanford, Calif. 1969. Pp. 310. Illus. $8.50. The recent outstanding advances made in the chemical aspects of photosynthesis based mainly on experiments with unicellular organisms has led to a relative neglect of its physiology. To repair this imbalance, the author has drawn on experiments dealing with photosynthesis by leaves of higher plants whenever possible. Part 1, the photosynthetic system deals with chloroplasts and their pigments, and the diffusion paths. Part 2, with the physiology of photosynthesis. These summaries of recent and current research findings constitute a much needed work of reference. Very highly recommended.

THEORIES ON THE NATURE OF LIFE, by Giovanni Blandino. Philosophical Library, 15 E. 40th St., New York, N. Y. 10016. 1969. Pp. 374. Illus. $6.00. In the first part, the author attempts to present objectively the formal thought and investigation into the nature of life. In the second part, he advances his own opinion on the nature of life. In the third part, he presents appendices on problems about chance hypotheses and evolution, and the problem of cybernetics. Highly recommended.

PLANT LIFE LIBRARY—continued on page 69.

2. LINEAGICS

[BIOEVOLUTION, DESCRIPTION, DETERMINING RELATIONSHIPS, GROUPING INTO LINEAGES]

COLLECTING SOUTH AMERICAN AMARYLLIDS, 1964—1968

J. L. Doran, *1117 N. Beachwood Dr.,*
Burbank, California 91502

Having been interested in amaryllis for many years I finally became aware of the species, the acquisition of which has become an obsession. I have acquired them in any possible way. The object is to develop a pool of germ plasm to enable the hybridizers to further produce new and more novel colors, patterns, and conformation, inasmuch as the Dutch have probably reached the limit with the few species involved in the Dutch hybrids.

The first trip was to central Peru in 1964. Next across the Caribbean and into Brasil in 1965. In 1966, we went thru a corner of Brasil and into northern Argentina. In 1967, we visited Central Bolivia and another area of Peru. In 1968 Central Brasil, across Paraguay and into northwest Argentina. These trips involved 100,000 miles of air travel and many miles by bus, truck, canoe, boat, and afoot. Generally, amaryllis only grow in inaccessible places. I found a very beautiful form of *A. psittacina* in an island-like shelf in the middle of a waterfall.

The most interesting acquisitions are:

Col. No.	Date	Habitat, Etc.
	1964	
D-5	Aug.	*Cr. erubescens* 2½ miles east of the Tinga María bridge in swampy muck soil, el. 2000 ft.
D-7	Aug.	Miniature *A. belladonna* west slope of the Cordillera Central, near the road between Tinga María and Pucalpa, about 10 miles west of El Boacrón de Padre Abat in sticky red clay soil, el. 7000 ft.
D-9	Aug.	Miniature *Eucharis* near El Bocaron de Padre Abat.
D-10	Sept.	*A. reginae* near Huinco, el. 1200 ft.
D-11	Sept.	*A. vittata* (Traub 1084 a-b) near Huicongo. Has very ruffled petal edges.
D-14	Sept.	*A. belladonna* salmon pink, small near Huayabamba river.
D-17	Sept.	*Hymenocallis* with yellow flower near Huallaga river.
	1965	
D-22	Sept.	Rose trumpet amaryllis on island in estuary of Rio Oronoco, el. 100 ft. approx.
D-25	Oct.	*Amaryllis* sp. with small flowers and narrow petal, Fa-

		zenta Sào Sabasteão, el. 2900 ft., dry forest, deep residual soil.
D-27	Nov.	*Hymenocallis amancaes* near Akebono, Peru in dry sandy loam, el. 100 ft.
	1966	
D-32	Oct.	Amaryllid, a very bright orange flower in sand in swamps near Coraguatatuba, Brasil, el. 100 ft.
D-34	Oct.	Possibly *A. flammigera* 50 Km. north of Foz de Iguasu in heavy red soil in shade.
D-36	Oct.	*A. aglaiae* on road to Tafi del Valle, el. 1050 meters open shade, moist loam.

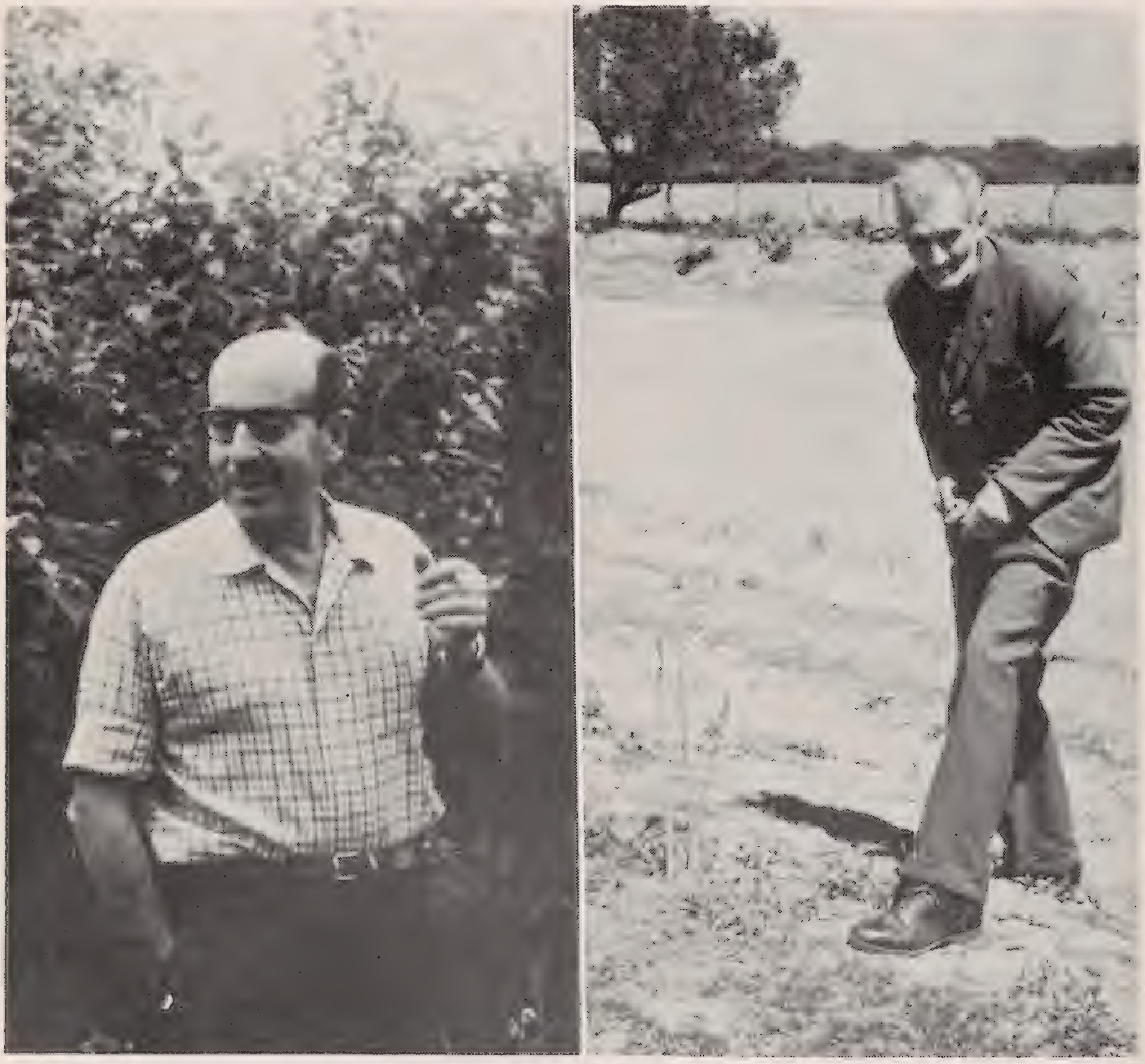

Fig. 8. Left, Dr. Carlos Gomez Ruppel in his garden, Mendoza, Argentina. Right, Sr. Alejo Moris at the site, in front of him, where the plant, *Amaryllis tucumana* or *A. immaculata* was found, a few miles north of El Galpón, Argentina, near the 25 S. latitude on the map (see Fig. 11). Photos by J. L. Doran.

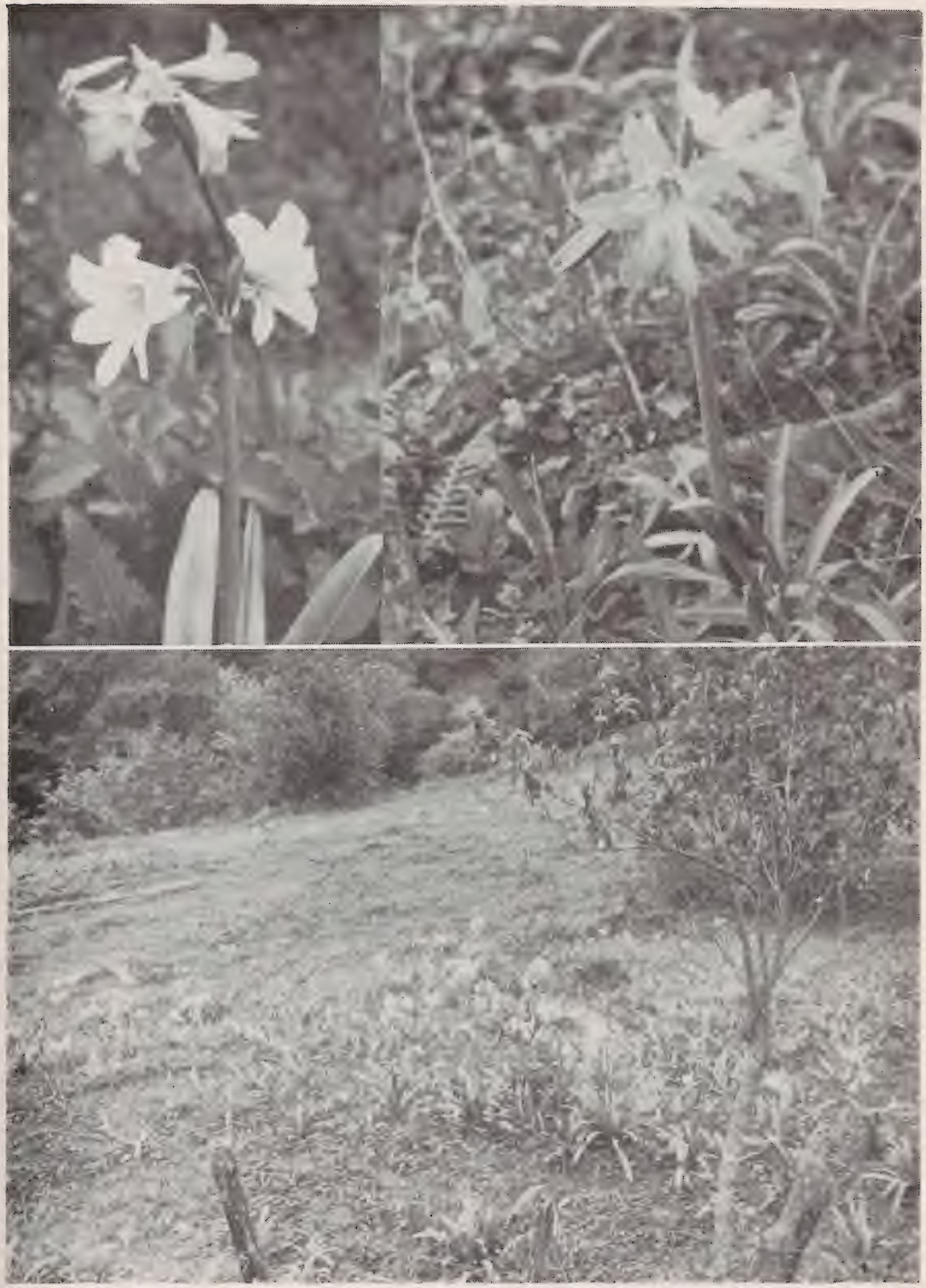

Fig. 9. *Amaryllis aglaiae* Castellanos, growing near Meseta de Acucena on the road between Acheral and Tafi del Valle. Upper left, light yellow form; upper right, red form; Lower, group of the yellow and red forms. Photos by J. L. Doran.

D-40	Oct. 1967	*A. ambigua* in full sun, flat valley, north of Córdoba.
D-44	Oct.	*Chlidanthus boliviensis* north of Cochabamba, el. 11,000 ft. in gray clay soil on steep slopes.
D-46	Oct.	*A. pardina* (?) or hybrid south of Santa Cruz, Bol., in newly cleared forest land, el. 1500 ft.

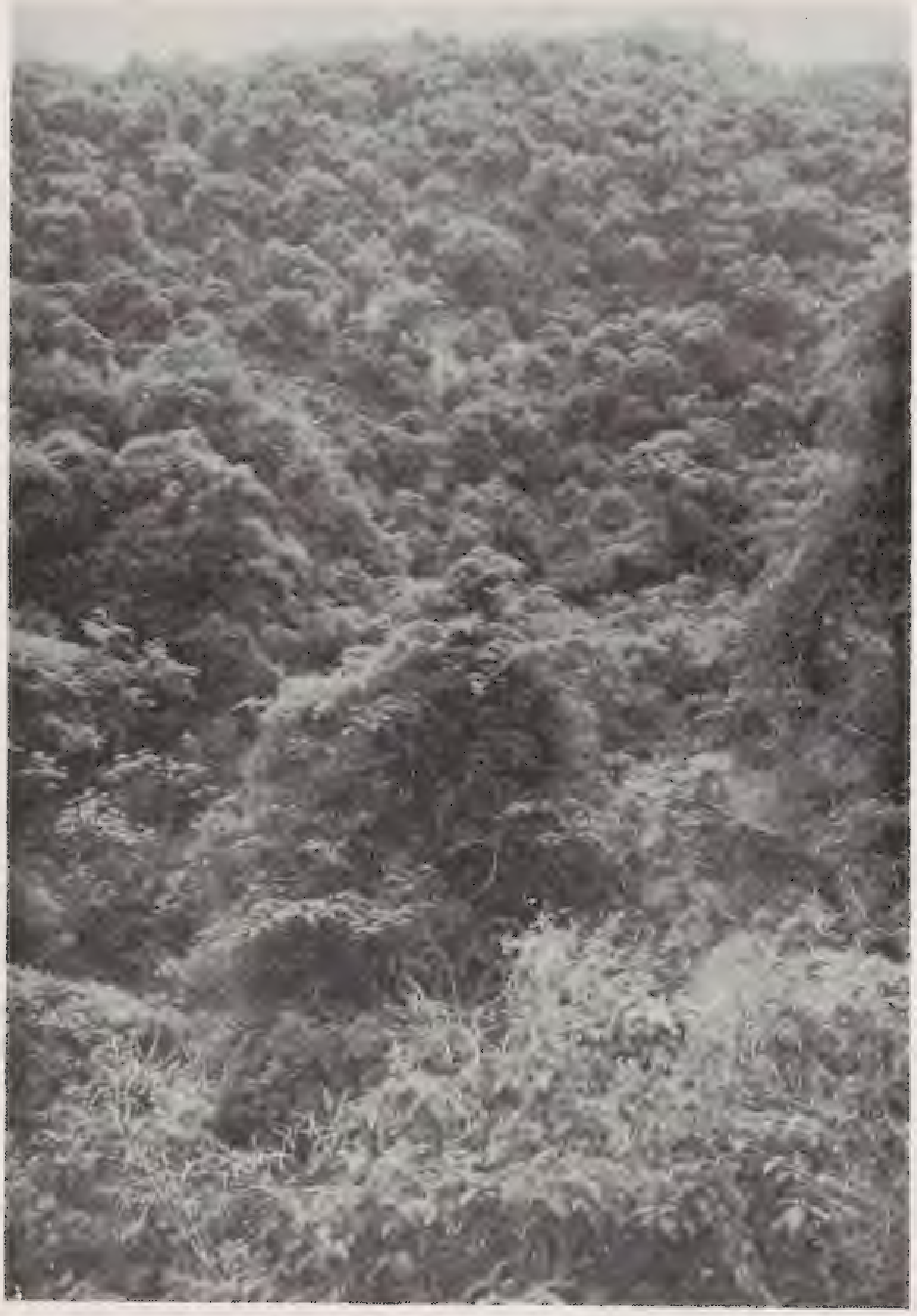

Fig. 10. Wall of canyon, habitat of *Amaryllis aglaiae*. Same location as indicated in Fig. 9. Photo by J. L. Doran.

D-49	Oct.	*A. vittata* (?) or natural hybrid, tyrian purple color across petals 35 miles west of Santa Cruz in sandy, dry, barren hills, el. 2600 ft.
D-52	Oct.	*A. belladonna,* roseine purple in shade 6 km. south of Tarapota, Peru and 1 km. east of road of Juan Guerrera.
	1968	

D-59	Oct.	*A. fosteri* 8 km. north of Amargosa, Brasil in sun in edge of heavy brush thickets in dry loam.
D-61	Oct.	*A. reginae* between Arcacé and Piedra Azul Espirito Santos, Brasil.
D-64	Nov.	*A. tucumana* (?) 11 km. north of El Galpón, Argentina in heavy, moist clay soil.
D-66	Nov.	*A. aglaiae* (?) red form 36 km. from Acheral on road to Tafi del Valle at Meseta de acucena at 1200 meters in meadows in heavy shade in grey, loam soil.

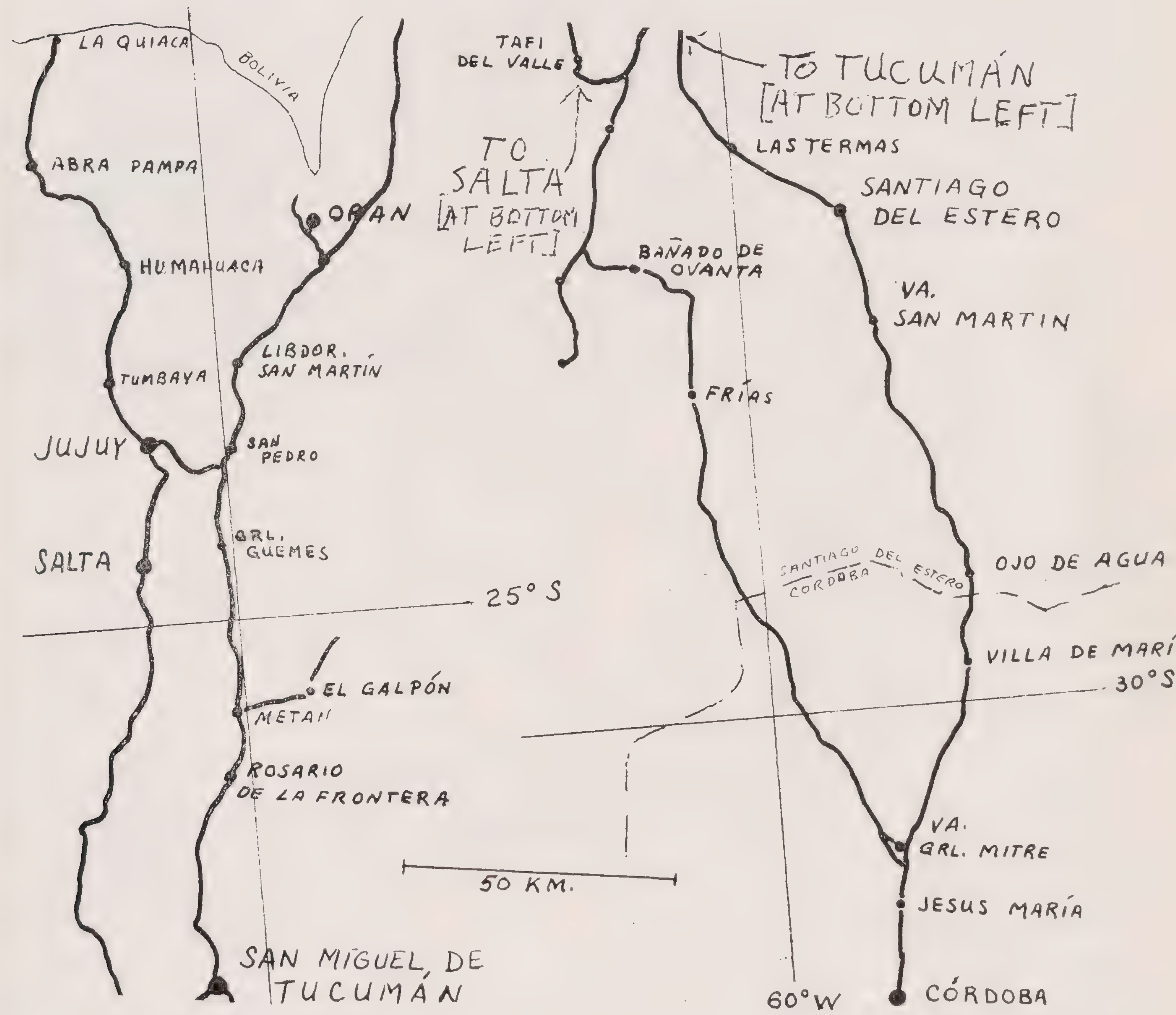

Fig. 11. Map of Northwestern Argentina, the area is rich in *Amaryllis* species—*A. parodii* at Villa de Maria, Rosario de la Frontera, Salta; *A. belladonna* L. at Oran; *A. immaculata* at Tumbaya; *A. tucumana* (?) near El Galpón; *A. aglaiae* near Tafi del Valle, etc.

Fortunately No. 61 bloomed this spring and it was an *A. reginae* exactly like the one (#10) found earlier in Peru. Nearly 2,000 miles apart! No. 22 is an outstanding flower, large blossoms from very small bulbs, if this should be a new species and can be crossed with the trumpets from Argentina and Bolivia it should produce some interesting seedlings. No. 25, *A. santacatarina, A. flammigera* and *A. argilagae* are very similar. No. 27, *H. amancaes* grows along the coast of Peru, which is a desolate desert with no rainfall, but in a few tiny spots of a few acres, they get up to 5 inches of rain a year. Here the bulbs are found 6 inches deep with the roots growing up through the tunics to near the surface where the soil is moist. No. 32 may be a contribution to brighter orange flowers. No. 49 is an outstanding flower very similar to *A. vittata* var. *vittata* but does not have a white keel and the coloration is a tyrian purple. No. 52 could add a new color tone to hybrids—as a species it is outstandingly beautiful. When we inquired about *A. aglaiae* we were told that someone had pastured hogs in the area where we had collected them before, the hogs had destroyed them all. (Fig. 9) We went farther into the mountains and found an area covered with them. This area was forested with large spreading trees containing many bromeliads and orchids which were in bloom. The ground was shaded but was covered with fuschias and ferns. The area was typical of a cold rain forest, very damp and cool. The red and cream colored forms grew together (see Fig. 12).

#64, *A. tucumana* (?) the large bulbs of this were 7½ inches in diameter. We had to send for a shovel to dig them.

When we decided to try to collect *A. fosteri* for re-introduction, we wrote Mulford Foster for more information. Although his instructions proved adequate, it seemed impossible to obtain much information. Friends in Brasil did forward a map and some information but it seemed like a "wild goose chase." Going inland from Salvador by bus, we left the tropical rainy area and entered a dry desert country, covered with thorn bush, cactus, harsh bromeliads, and thorny palms. This thorn covered "horror" was so dense in places that it could not be penetrated. We were told that the rains would come in 5 to 6 weeks, for this reason I did not expect to find *A. fosteri,* believing that it would bloom and grow after the rains. My guides did not understand what I was looking for and were of no help. I found no sign of *Amaryllis.* After several hours of criss-crossing the area west of Amargosa looking for dry leaves, I came upon it in full bloom. Once Antonio knew what we were looking for he knew where to find more. Seventeen scapes were collected with 93 flowers, average of 5½ with 4 the least and 8 the most per scape. The diameter of the largest bulb was 8 cm. The smallest blooming bulb was 3.2 cm. diameter. Bulbs as small as 2 cm. diameter were found with well developed rhizomes. Rhizomes were produced as in other species *but in another manner,* the rhizome grew off the root plate and came out of the side of the bulb by penetrating the scales (see Fig. 13). All bulbs had a well developed root system although the soil was very dry. There was no hint of new leaves. Seed pods were 3½ cm. diameter by 2½ long. Pods were observed that were nearly ripe and bulbs were found with a scape just starting, but

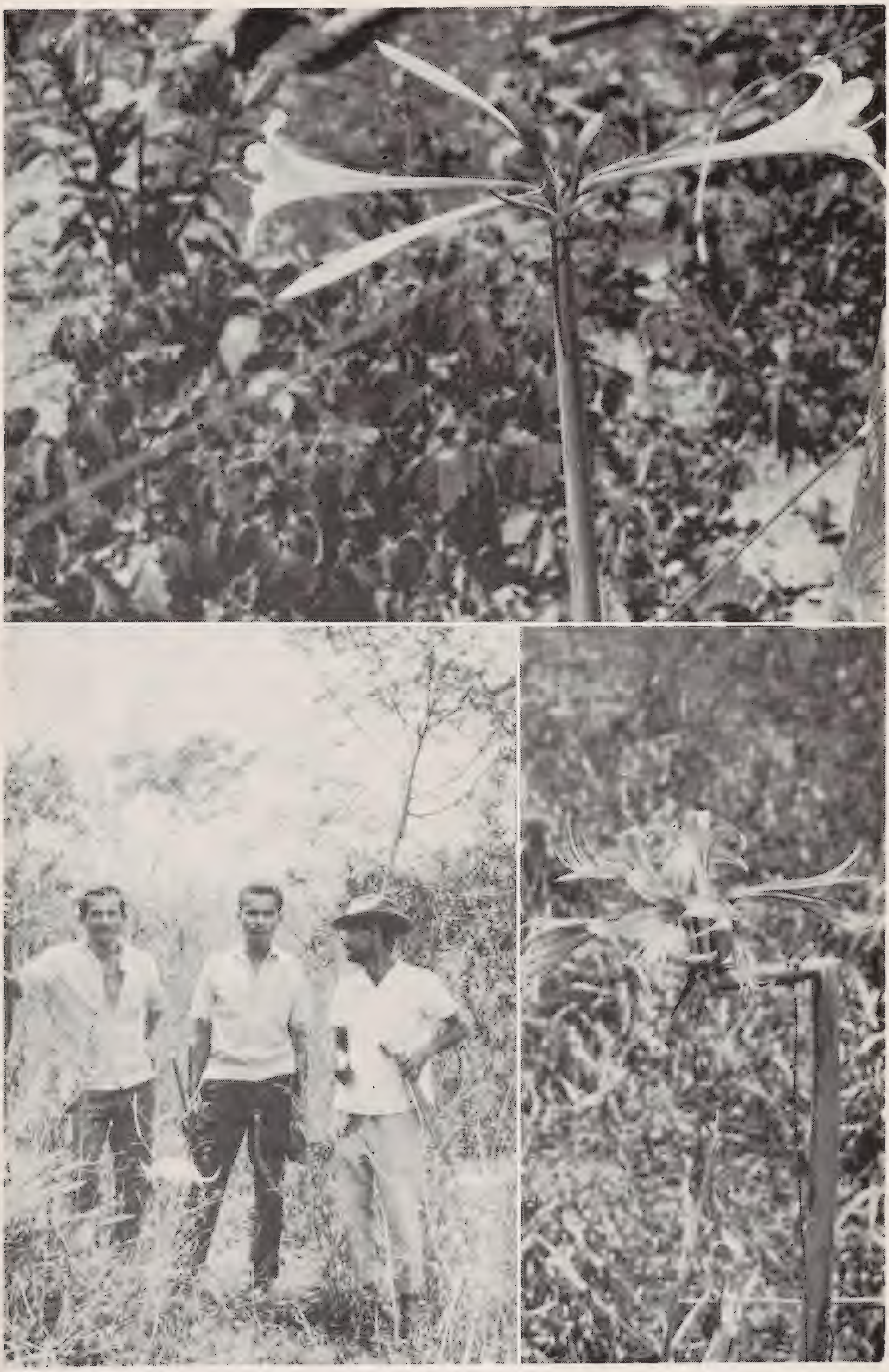

Fig. 12. Upper, *Amaryllis tucumana,* found a few miles north of El Galpón, Argentina, growing at the edge of a pasture. Lower right, *Amaryllis fosteri*, area near Paraizu, Brasil (see Fig. 11). Lower left, helpers standing back of a plant of *A.* fosteri, same general location. Photos by J. L. Doran.

the seed should have been ripe before or shortly after the rains start. The color of flowers found growing in the sun was closer to China Rose HCC 024/2 than a salmon pink.

Referring to the map (Fig. 11) of northwest Argentina: The holotype of *A. parodii* was found between Villa de Maria and Ojo de Agua. *A. ambigua* is found between Cordoba and Jesus Maria. *A. belladonna* is found near Oran. A different form of *A. parodii* or a new species is found near Salta and another type east of Rosario de la Frontera.

We plan to make another trip in November and December 1969.

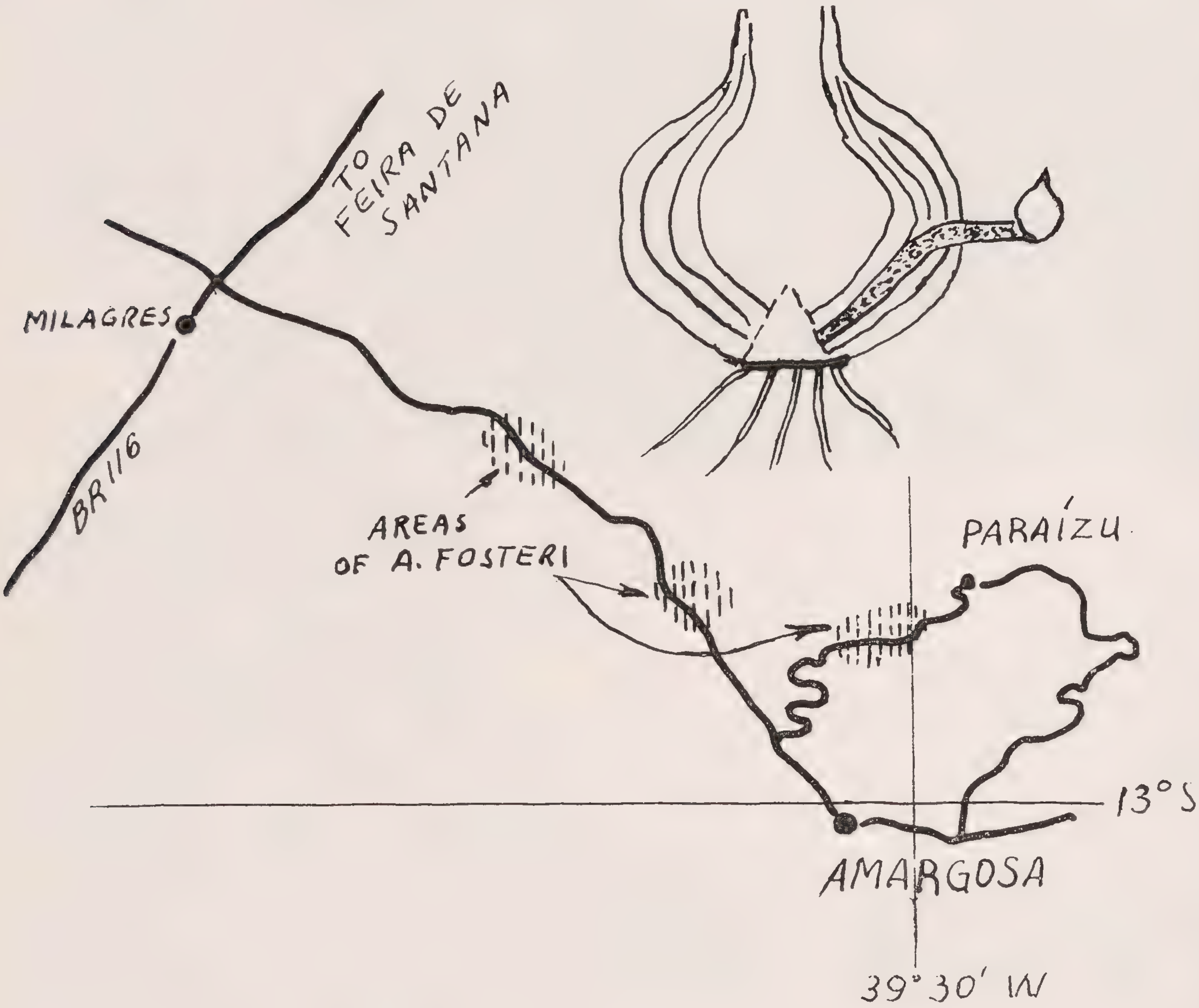

Fig. 13. Map showing the areas where, *Amaryllis fosteri* grows, about 110 Km. (by road about 280 Km.) west of Salvador, State of Bahia, Brasil. Upper right, sketch showing how *A. fosteri* produces rhizomes.

MAY-JUNE 1969 COLLECTION TRIPS

C. G. Ruppel, *Mendoza, Argentina*

After several days on the go, I arrived on the 26 May in Salta which is in Northern Argentina. Already I had gotten two big *A. belladonna* "*minor*" bulbs which is a valuable miniature. But as it lacks hardiness in the heavier frosty zones, it must be constantly renewed at Mendoza in order that one can see it bloom. Amongst its strong points are: (1) In itself, it is a desirable miniature, (2) It sets seeds freely and (3) It crosses and since it does, and as the following are all frost resistant in my area, the following could give some of that desired hardiness as in the *A. belladonna ''minor''* x *A. aglaiae, A. b. ''minor''* x *A.* species *''Red Cochuna''* and also in *A. b. ''minor''* x *A.* sp. *''Yanellosianum''*. Further work would be necessary to select out that which retain the desirable characteristics of the *Amaryllis belladonna ''minor''* type.

After leaving here, I intend to go to Posadas, Misiones to plant some *Heliconia* spp. rhizomes (Musaceae) as the climate back-home in Mendoza is too cool for their rapid growth altho they are hardy there. Here with its tropically warm, humid climate and the right soil, the *Heliconia* spp. rhizomes will multiply much more rapidly for me. Also, I've set my mind to go to Santo Tomé, Corrientes to seek for more bulbs of *Amaryllis* sp. *''Mrs. Sosa''* and of *Amaryllis angustifolia.*

On the way from Salto to Posadas, I received some most intriguing information. For I was told that near Rosaria de la Frontera, there grows an *Amaryllis* species with a long trumpet, white and red stripe in color, the flowers are many and fragrant too. Could this be the home-grounds of the species, *Amaryllis ambiguum?*

On arriving on June 1st at Posadas, Misiones, the persistent rainfall hindered any but the shortest of trips. Luck was with me though. For on one of these short jaunts, a cherished lost plant was found again. Now, *Aloysia virgara* (syn. *Lippia* in the *Verbenaceae*) is a showy low bush with local name of ''Niño Urupá''. It has dense dark green foliage, bears myriads of long white single racemes of flowers which are sweetly vanilla-scented and bears them from late spring to frost! Here, getting it from the wilds, I could study its habitat and its needs so that I could give it the right care this time at home and not lose it thru ignorance.

Before one can leave for Santo Tomé, near Posadas, the weather must clear first as the heavy rain makes the roads impassable and I'm left helpless to get to the place to obtaining more bulbs of *Amaryllis angustifolia.* But finally, good weather came and I arrived on the 3rd of June in Santo Tomé. So I was able to reach the swamps where *Amaryllis angustifolia* grows deeply imbedded in the muck with water on top. After hard work, a half-dozen mature bulbs were gotten out. A hundred bulbs would have been fine but they are rather scarce and they are difficult to dig. For the bulbs have very long necks—25 to 30 cms—(10″ to 12″) which are covered to the base of the leaves by water and the stirring up of the sticky mud further makes the task troublesome to do.

Fortunately, this species bloomed for Mr. Paul H. Williams, Jr. of Fort Worth, Texas this year. It had an amazing scape which bore 9 red flowers. To say more, I would rob Mr. Williams' article which he plans to write for publication in PLANT LIFE. This I'm sure the *Amaryllis* fans will appreciate.

Unluckily, there were no bulbs to be had at this time of the *Amaryllis* sp. *''Mrs. Sosa''* which has a long green chartreuse trumpet and is evergreen.

Also while I was in Santo Tomé, there occurred the unhappy event of losing Mr. Pablo Argilaga (see the 1967 PLANT LIFE) from a heart attack. I'll miss him very much for he was not only a fine gentleman and a fine friend but also one who helped me a great deal in searching out for amaryllids and the like.

TWO BRASILIAN **AMARYLLIS** SPECIES

Harry Blossfeld, *Rua Pedro 336,*
Tremembe da Cantareira, São Paulo, Brasil

AMARYLLIS AULICA KER-GAWLER

Habitat and behavior: Collected in forest of Cantareira Mountains, north of São Paulo City, in Brazil, at 3000 feet altitude, epiphytic. A large clump of bulbs grew attached to a bow of a woody bignoniaceous liana stretched between two huge trees standing on a steep slope. The clump had about ten peduncles, each bearing two or four open flowers, the whole looked from a distance like a scarlet umbrella swinging in the air. It was an unforgettable sight.

The species flowers in late fall to mid-winter, a good bulb generally producing two peduncles, with two or four flowers each. The plants lose their leaves here in Brazil in March, and quite reluctantly, and already in April appear the tips of flower sheaths on the bare bulb. While these are growing slowly, the new leaves come out vigorously and when the buds break through the sheath, the plant has already all its leaves completely developed to final size.

Due to the blooming period being in the cool winter season, the flowers last a long time and may remain in perfect condition during 20 days; this species has the best lasting qualities of all species and hybrids in the author's collection and being out-of-the-season, it always attracts much attention in our lath house.

It is of easiest possible cultivation and will stand almost any type of neglect, but it is sensitive to excessive watering in fall, while the leaves drop or while it is bare. It will, however, endure drought and poor soil and may be kept two or three years in the same pot without fertilizer and still will bloom. It enjoys a light, porous soil, with some orchid fibre mixed in and when the growth starts, an occasional application of a weak solution of chicken manure will produce a decided increase of vigor and blooming.

Description: Bulb 7.5 to 10 cm in diameter, pear shaped, producing a sucker every other year. Covered by brown tunics and in natural conditions, mostly above the soil or moss, not buried. *Leaves* on strong bulbs from 6 to 10, about 50 cm long and 5 cm broad, tapering to both ends, with a blunt tip; at base very slightly flushed with purple and decidedly keeled. Apical half almost flat above, but with a prominent rounded keel below. The surface appears opaque by about 40 minute longitudinal fluted veins. The foliage remains about 11 months on the bulb.

Peduncle one to four per bulb, in late fall, starting simultaneously with leaf growth; stem hollow, sub-cylindric, up to 50 cm long, at base 2 cm diameter, tapering to 1.3 cm at tip, where it becomes oval, flattening into a two-valved sheath, 7.5 to 10 cm long. *Spathe valves* wilting while buds open, about 7.5 cm long and 1.8 to 2.1 cm broad at base, becoming straw coloured and finally clear brown. *Bracteoles* two to four, 4.3 cm long and at base, 6 mm broad, triangular in shape. *Pedicel* cylindric, plain green, 3.7 cm long when flowers open, but stretching to over 8 cm length when the pods approach ripeness. Diameter 0.9 cm. *Ovary* with a darker green colour, 1.5 cm long, somewhat trigonous and set at a 45° angle to pedicel, so that the flowers open in a horizontal position. After fertilization, the ovary joint straightens, so that the pods bear the wilted remains of the flower atop.

Flowers on good sized bulbs, four to an umbel, each measuring 15 cm in diameter, all segments being bright crimson, with purple reticulations; perigone about 12.5 cm long. Segments quite different in shape, giving the flower a very peculiar form, that remembers of an orchid blossom. *Outer segments* 12.5 cm long and 1.8 to 2.5 cm broad, the uppermost broadest and straight, the others narrower and slightly falcate. On their back is a prominent greenish keel ending into a greenish appendageous tip. *Inner segments* slightly shorter, but much broader, up to 5 cm wide and flat, except the lowermost, which has a typical notch near the base, where it folds up, tightly wrapping the bundle of filaments. *Paraperigone* characteristic, in shape of a green, globular bladder at the bottom of the flower, leaving open but a small slit atop, where insects may plunge their tongue to get at the nectar. *Perigone* as a whole, of vivid crimson colour on the inside; but as reticulation becomes denser and its veins almost confluent near the base of all segments, the general colour in the center of the flower deepens to a velvety purple of extraordinary beauty. Only the innermost 1.2 cm area around the paraperigone is green, each segment having a crimson center stripe, across the green area. *Filaments* crimson, except at the base, where they emerge greenish from the paraperigone. With their basal half they lie flat on the lowermost segment, then curve upwards. *Anthers* pale violet, 1.3 cm long and four-angled when closed. They have a vertical position and after splitting, shrivel considerably. *Style* crimson, a little longer than filaments, ending into a trifid stigma, each division 0.6 cm long. *Pod* green, 5 cm in diameter, inflated trigonous, containing 100 to 150 seeds. Gestation period 70 days. *Pods* split wide open when ripe and release seeds to the wind. *Seed* papery, dark brown, glistening and hyaline, triangular or half circular in shape, 2.2 cm by 1.3 cm. Weight 4000 seeds to one ounce.

General comment: Amaryllis aulica is, for the amateur collector, one of the most desirable species, because it is so easy to grow, showy even when not in flower and really beautiful when in bloom. Its blooming period in winter gives it a special merit and it is strange and regrettable, that hybridizers did not insist upon selecting winter flowering strains from its hybrids. The floral characters and the very bright colours recommend it for breeding

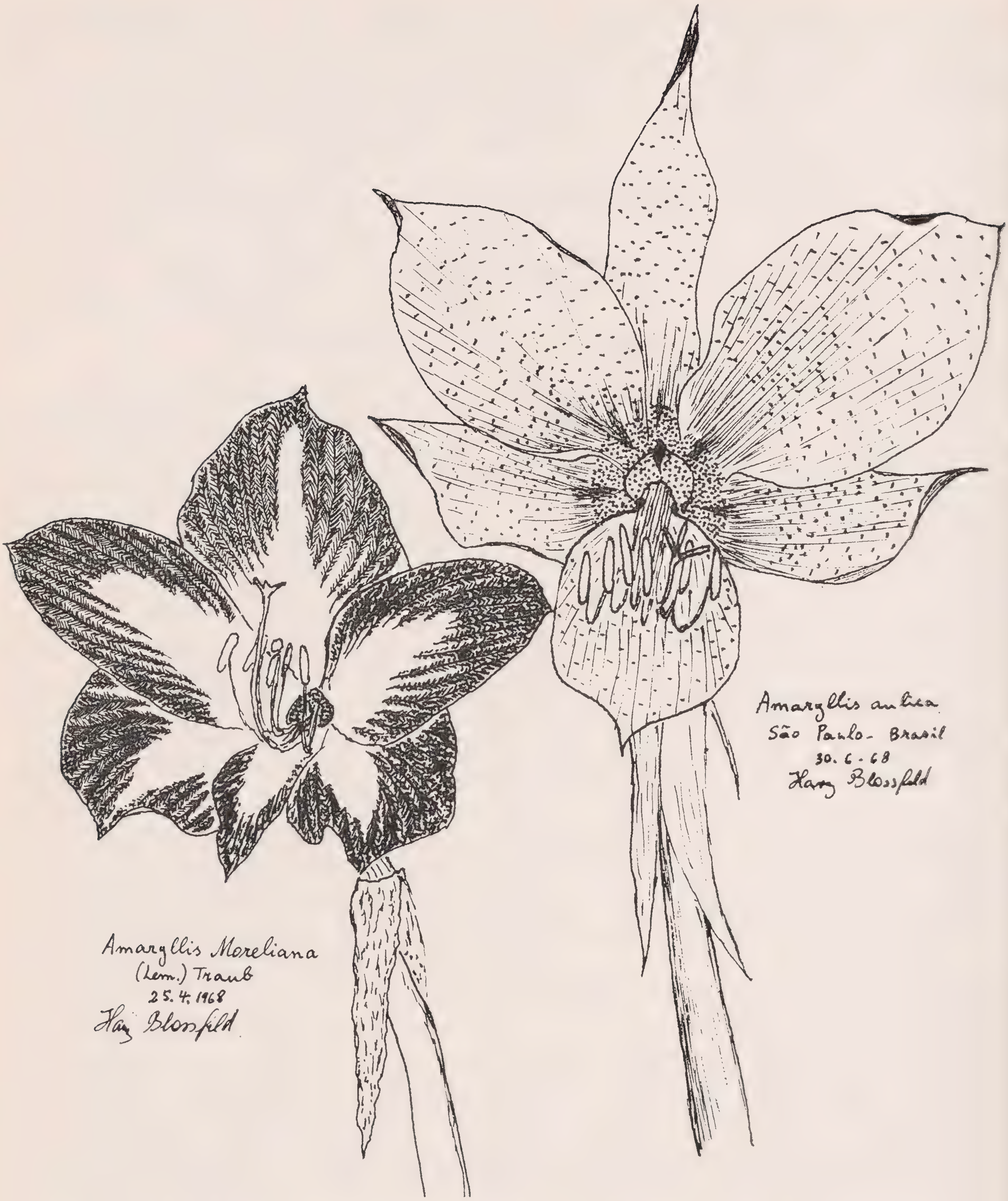

Fig. 14. *Amaryllis moreliana* (Lem.) Traub and a rare form of *Amaryllis aulica,* as grown by Harry Blossfeld, in Brasil. From drawings by Harry Blossfeld.

AMARYLLIS MORELIANA (LEM.) TRAUB

Habitat and Behavior: Collected in the Organ Mountains, near Novo Friburgo, in the Rio de Janiero State, Brazil. The species grows generally on rocks, in humus deposits that accumulate in fissures of granite stones, preferably under the light shade of small-leafed shrubs. Flowering season in Brazil is quite variable, from fall through winter and rarely in spring. This irregular blooming habit is quite singular and has been confirmed for more than ten years, since the author grows this species. During all that time it occurred only twice, that from the eight original bulbs, two were blooming simultaneously. The fact should be considered by hybridists.

The species is easy to grow, but the bulbs are slow to increase in size and reluctant in producing stolons or offsets. Its flowers are quite similar to those of *A. psittacina,* which however has a more solid paraperigone; it is related to *A. correiensis* and to *A. aulica.* A remarkable fact is, that when it flowers in fall or winter, it does so on the bare bulbs but if it blooms in spring, the scape will grow simultaneously with the new leaves. The plant generally produces but one peduncle on each bulb and in some years, it fails to bloom at all.

Description: Bulb rather big, 7.5 to 12.5 cm in diameter, globular, covered by dark brown tunics. Neck of bulb quite prominent, 10 cm high, 3 cm diameter, sub-cylindric and slightly tapering to tip. *Leaves* 5 to 6 per bulb, 60 cm long by 4 cm broad, lorate, dark green, opaque above and glaucous below, having a strongly canaliculated midrib. *Peduncle* growing from the bare bulb in fall or winter, or together with new leaves in spring; 35 to 50 cm long, sub-cylindric, 1.5 cm in diameter, hollow, glaucous green and sometimes flushed with purple in lower third. *Spathe* two-valved, green while flower buds open, but wilting while in bloom, 8 cm long at base, 1.8 cm broad. *Bractioles* two, 5 cm long and at base, 0.3 cm broad. *Pedicel* clear green, slightly tapering and trigonous, 6 cm long, that is, much shorter than spathe valves; pedicels stretch to 8 cm length, while the pods ripen. *Ovary* 1.5 cm long, dark green, trigonous.

Flowers usually two on a scape; fall, winter or rarely spring. *Perigone* funnel-shaped, with a curiously oval shape of the rim, which measures 12 cm in horizontal diameter and 10 cm vertical diameter. This peculiar feature is caused by the very stiff and broad upper segment, that resists to the vertical expansion of the perigone. *Paraperigone* reduced to a triangular ring of whitish scales, edged with red. *Outer segments* almost equal, 5 cm broad (!) by 12.5 cm long, having along the center of outside face, a strong green keel with darker green reticulations, alongside of which is an area suffused with red dots along these reticulations and near the rim, the red colour becomes confluent. On the inside face, the reticulation is not apparent and replaced by green divergent veinings irradiating from a broad green central stripe, which is quite conspicuous in this flower. Towards the border, these veinings turn red in a feather pattern, forming 9 to 11 divergent curved lines, that become confluent near the sepal borders and are an almost solid red near the segments tip. *Inner segments* much narrower, 3.5 cm by 11 cm, the lowermost being only 2 cm broad at widest place. Outside face plain green, only obscurely reticulated, having divergent green veinings which turn red only quite near the margins and become confluent in an area of about 2 cm from the segments tip. The inside face shows a broad, dark green central stripe, which has six parallel fluted veins. This is enframed by a number of feathery streaks, that radiate from deep inside the perigone in way of partly interrupted veins towards the tips. There they become broader and finally are confluent at the edge of the segments. *Filaments* whitish, shorter than segments, the apical half curved upwards and faintly suffused violet. *Anthers* while closed, pale lilac and remarkably big: 0.7 cm long, but on second or third day shrivelling to almost half that size. *Style* longer than filaments and of identical colour, resting flat on the lowermost segment while the flower is opening, but later curving upwards. *Stigma* irregularly trifid, whitish, spreading only partially and reluctantly.

Pod 3.7 cm diameter, inflatedly trigonous, containing an average of 100 seeds each. The dry remains of perigone remain on pod until it splits. The pod then becomes yellow and opens to 45°, releasing the interleaved seeds to the wind. Seeds dark brown to almost black, papery, somewhat hyaline on margins, glistening, in shape of an equilateral triangle to almost semicircular. Weight 13 grams per thousand, but almost twice as much, when gathered from a freshly split pod.

General remarks.—The above description was made from a rather small number of plants grown by the author, representing field collected stock. These plants were remarkably uniform, but originated from one locality; there appear to be some rather confusing coincidences of this plant with the descriptions of *A. correiensis* and *A. psittacina*, which should be investigated by a comparing study of live authentical material with the original diagnosis. The old descriptions mostly lack information of very important distinctive characters now recognized as such, and should be amended.

ZEPHYRANTHES (SUBG. COOPERIA) MORRISCLINTII

Hamilton P. Traub and Thad M. Howard

Up to the present time only white- and yellow-flowering species in the subgenus *Cooperia*, genus *Zephyranthes*, have been reported. Several years ago, the Morris Clints and Thad M. Howard collected in Mexico a pink-flowering species in this group. This species is here appropriately named *Zephyranthes morrisclintii*, to commemorate the memory of the late Morris Clint (see 1968 PLANT LIFE page 16).

This new species represents a valuable color addition to the dependable Cooperia group of *Zephyranthes* which is now widely cultivated and/or naturalized.

Zephyranthes (subg. **Cooperia**) **morrisclintii** Traub & Howard, **sp. nov.**

Holotype: Traub No. 1000 (TRA), cult. La Jolla, Calif., grown from bulbs, collected by Dr. Thad M. Howard near Iturbide, Nuevo Leon, Mexico.

Bulbus 4-4.5 cm. longus 4.7-5.5 cm. diametro, collo 4.5-5 cm. longo; foliis 3 vel 4 viridibus usque ad 36 cm. longis 7 mm. latis; scapo usque ad 10.5 cm. longo; spatha 5-5.4 cm. longa; umbella uniflora; floribus laete roseo-rubellis; pedicello 3-3.5 cm. longo; tubo tepalorum 3.5 cm. longo; segmentis tepalorum 4.1 cm. longis 2.2-2.4 cm. latis; staminibus biseriatis 1.1 et 1.7 cm. longis.

Bulb globose, 4-4.5 cm. long, 4.7-5.5 cm. in diam., neck 4.5-5 cm. long, 7-10 mm. in diam.; tunics dark brown. *Leaves* 3-4, linear, green, up to 36 cm. long, 7 mm. wide, bluntly acute. *Scape* compressed with rounded edges, lighter green, slightly reddish near the base, up to 19.5 cm. long, 4x6 mm. in diam. at the base, narrowing to the apex. *Spathe* reddish, 5-5.4 cm. long, united for 3-3.5 cm. below, apex single, fenstrate in specimens examined. *Umbel* 1-flowered; flowers light rose pink (HCC 427/2 to 427), lighter on the inside. Scent similar to that of other species in subg. *Cooperia* but not as strong. *Pedicel* 3-3.5 cm. long, 2x3 mm. in diam., slightly compressed, with rounded edges. *Ovary* oblong, 1 cm. long, 4x4.5 mm. in diam. *Tepaltube* 3.5 cm. long, enlarging upwards, 3 mm. in diam. (base), 7 mm. in diam. (apex). *Tepalsegs* oval, subequal, 4.1 cm. long; setsegs 2.4 cm. wide, apex rounded, apiculate, petsegs 2.2 cm. wide, apex rounded. *Stamens* upright, in 2 series, 1.1 and 1.7 cm. long; filaments white, anthers affixed 2 mm. from lower end; pollen yellow. *Seeds* D-shaped, flat, dark brown to black.

Range.—Collected by Dr. Howard (#64-A), State of Nuevo Leon, Mexico, Highway 60, near Iturbide. The species was also collected by Mr. & Mrs. Morris Clint.

CHLIDANTHUS CARDENASII SP. NOV.

HAMILTON P. TRAUB

For a long time the genus *Chlidanthus* appeared to be monotypic with only *C. frangans* Herb., but in 1957, a second species, *C. boliviensis* Traub & Nelson was added. Later (1967) the hybrid between the two, *C.* x *traubii* Moldk. was added. In 1968 Dr. Martin Cardenas sent a specimen with description of still another species (Fig. 15), which is here appropriately named in his honor.

Chlidanthus cardenasii Traub, **sp. nov.** (Fig. 15)

Holotype: Cardenas specimen (TRA no. 1001), collected by Dr. Martin Cardenas at Mollevillque, Prov. Bilbao, Dept. Potosi, Bolivia, alt. 2,2000 m.

Bulbus globosus 8 cm. longus 8-10 cm. diametro; foliis hysteranthis angustis viridibus; scapo 20 cm. longo solido compresso unimarginato; spatha lanceolata; umbella octoflora; pedicellis 2-3 cm. longis; ovario obscure trigono; tubo tepalorum 2.5 cm. longo; segmentis tepalorum lanceolatis 1.6-1.7 cm. longis 5 mm. latis smaragdinis; staminibus 1-1.2 cm. longis; stylo 5 cm. longo; stigmate trifido; capsula doliiformi.

Bulb globose, 8 cm. long, 8-10 cm. in diam., tunics dark brown; leaves appearing after the flowers, narrow, green, not fleshy; scape 20 cm. long, 1.2 cm. in diam., solid, flattened, pink with one conspicuous 1-1.5 mm. edge; spathe lanceolate, 6-9 cm. long, acute; umbel 8-flowered; pedicels 2-3 cm. long at anthesis, elongating to 6 cm. in fruit, slender pink; ovary obscurely trigonous, 10-15 mm. long, 3-4 mm. in diam., purple-brownish; tepaltube 2.5 cm. long, slightly widening above, pink below, green-streaked above; tepalsegs lanceolate, 1.6-1.7 cm. long, 5 mm. wide, emerald green keeled purple-lilac on under side; stamens 1-1.2 cm. long; filaments light green, thin, expanded below and inserted at the base of the tepals; anthers light yellow, versatile; style 5 cm. long, light green, thin; stigma trifid with thickened tip, pruniose; fruit a 3-celled capsule, barrel-shaped, 3x1.5 cm.

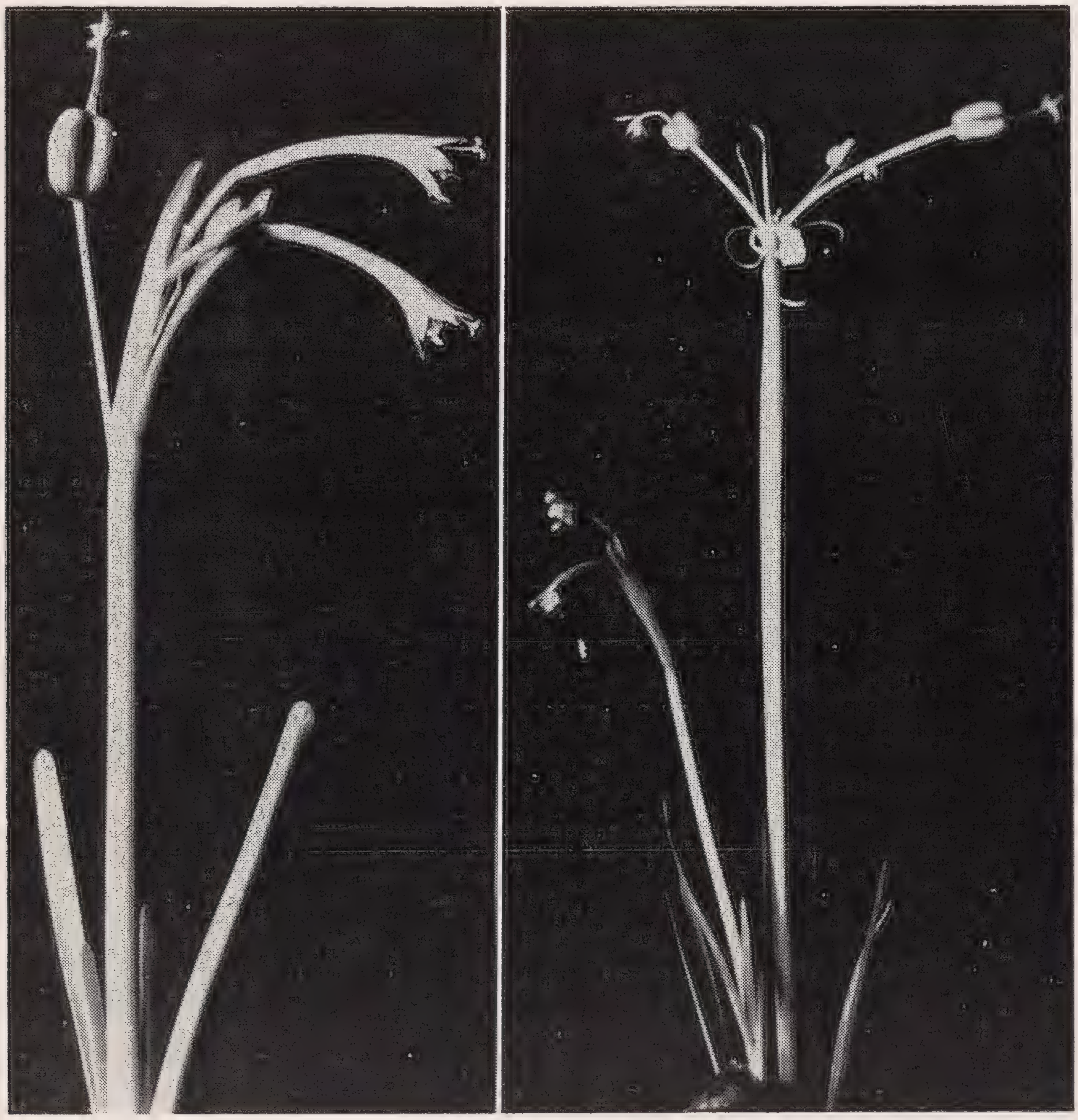

Fig. 15. *Chlidanthus cardenasii* Traub, *sp. nov.* Native to Bolivia. Photo by Dr. Martin Cardenas.

Range.—Known only from the holotype locality, Mollevillque, Prov.

Bilbao, Dept. Potosi, Bolivia, alt. 2,2000 m. plants are deeply situated in the dry mountain crevices.

AN AQUATIC **AMARYLLIS** SPECIES FROM ARGENTINA

Paul H. Williams, Jr., *6128 Sundown Drive*
Fort Worth, Texas 76114

In July 1967 a letter was received telling of a dried specimen of an *Amaryllis* species collected in a swamp in Misiones, Argentina, near the Corrientes border. Dr. Ruppel had seen the specimen in the Lillo Institute in Tucuman and was determined to collect this species with enormous deep-red flowers. As the road was under water and it was winter, he contracted with a young man to collect mature bulbs for him.

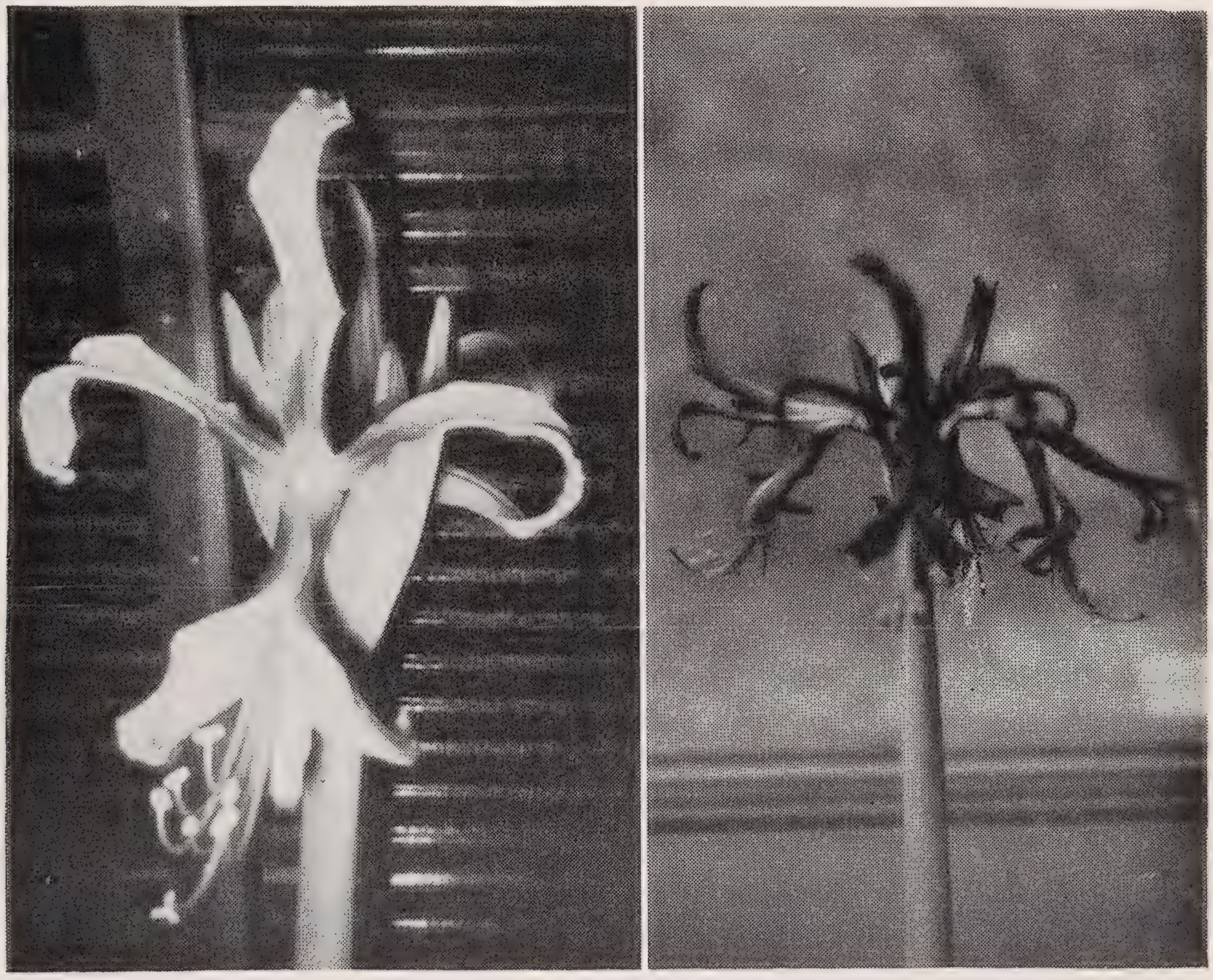

Fig. 16. The aquatic *Amaryllis angustifolia* (Pax) Traub & Uphof, native to the region near Santo Tome, Corrientes, Argentina. Photos by Paul H. Williams, 1967.

In October 1967, Dr. Ruppel received twenty bulbs, each showing the remains of a scape; however, two of the bulbs were three times larger than the rest. In March 1968 most of these bulbs were sent to the United States for distribution, with the intention of naturalizing them in various parts of our country. As the bulbs had been retained in dormancy since collection, they were to be immediately planted in part shade in rich organic soil and allowed to shift for themselves. They were believed to be capable of being under water for extended periods and also to go for long periods without water as they were located 20 to 25 cm. underground.

In August 1968 I received, by way of Florida, one of the two larger bulbs of this species showing the tip of a bud. New information had been obtained about its cultural needs. At the collection site, near Santo Tome, Corrientes, Argentina, "it is evergreen and grows in water up to its long neck, or higher, like cress among weeds". This bulb was potted but the scape aborted as did one over a month later. The pot was placed in the greenhouse for the winter and given routine *Amaryllis* treatment. In February 1969 a scape appeared which did not abort, and during March I was treated to the sight of nine "sprekelias" in one umbel!

The nine flowers were red or deepest rose. Segments, filaments, and style were all red and the pollen was yellow. One flower opened, then its opposite, then the one to the right and its opposite. Next the second set of four in the same order—the ninth opened last in the middle. This allowed bloom for a long time, with seed pods forming from early blooms as the last were opening. The spathe valves were large and held stiffly erect and green until half the flowers had bloomed. The blooms were about the size of *Sprekelia formosissima* but not quite as full in appearance. There were six leaves, the longest being 56 cm. long, and the widths varied from 3 to 4 cm. They are glaucous, linear, and margined, and are held stiffly erect—not keeled, but u-shaped in cross section for half their length.

All bulbs of the original lot arrived with long necks and not much bulb. Those that were potted have since lost the neck and gained in bulb size. The neck length of the collected bulbs was due to being under water. The necks allowed the leaves to grow above the water and is not a permanent identification feature under culture.

Bulbs planted in the yard did not show foliage this year (1969) until July. One bulb of the original lot was potted and is surviving under ordinary pot culture. Two offsets have formed. The pot containing the large bulb was placed in a large glazed pot without drainage which contains *Hymenocallis liriosme.* The water level in the glazed pot is maintained above the base of the *Amaryllis* pot. Under these conditions the *Amaryllis* is thriving in morning shade with full afternoon sun in our above 100 degree July heat. The plant in this pot has one offset. All three offsets are at the very edge of the pots, which leads me to believe this species may be rhizomatous. I have made no visual check as yet.

Now, as to identification, your guess is as good as mine. At the bottom of Page 153, 1969 PLANT LIFE, Prof. Ravenna refers this species to *A. angustifolia.* His description must be different from that of Page 127, 1938 HERBERTIA. At no time have any of the leaves been nearly as narrow as *A. angustifolia.* The flowers were never ''quite declinate''. Quoting from Dr. Ruppel—''the leaves were 120 cm. long x 5 cm. lat.'' ''I have only seen the habitat, bulb, and leaf. The latter does not fit (*A. angustifolia*). I measured many of them; all were 100-120 cm. long x 4-4 cm. lat.'' The bloom and cultural conditions would indicate *A. cybister* var. ''spectabilis'' as described on Page 295 of Dr. Traub's THE AMARYLLIS MANUAL.

Reciprocal cross attempts with *A. striata* forma *fulgida* were unsuccessful, as were attempts using stored pollen of *A. evansiae* and *A. moreliana.* Stored pollen of *A. yungacensis* was successful and seedlings are growing. Attempts at selfing also met with failure; however, seed of this species has been collected at the site in Argentina but would not germinate in Fort Worth. Stored pollen of this species and that of *A. moreliana, A. reginae,* and *A. pardina* was used on *A. ambigua.* The results were negative except for this species and one third pod from *A. pardina.*

The aquatic nature of this species opens exciting possibilities for hybrids more suited to the wetter regions of the southeast United States

ALLIUM MICHOACANUM SP. NOV.

Hamilton P. Traub

Allium michoacanum ranks among the smallest of the Mexican Alliums collected by Dr. T. M. Howard. Bulbs were received from him in August when the plants were past the flowering stage. Fortunately, it flowered in my garden as a potted plant on September 10, 1969.

Allium michoacanum Traub, sp. nov. Plant Life 24: 139. 1968, **anglise.**

Holonomenifer: Traub No. 1099 TRA, Sept. 4, 1969, grown from bulbs collected by Dr. T. M. Howard, Aug. 4, 1967, past flowering stage (Howard No. 67-74A) on Mexican Highway 15, k 233, east of Morelia, Michoacan, in the mountains.

Bulbus parvissimus 6 mm. longus 4 mm. diametro a bulbulis in rhizomatibus gracilibus amplificatus; foliis 2 vel 3 (-4) 12-18 cm. longis 1-1.5 mm. latis; scapo 18 cm. longo; umbella 4-7-flora floribus parvissimis albis non late aperientibus; pedicellis ca. 9 mm. longis; tepalis 6 mm. longis 2-2.25 mm. latis; filamentis quam tepalis brevioribus; stylo quam staminibus parum longiore.

Bulb very small, 6 mm. long, 4 mm. in diam.; coats membranous; increasing by bulblets produced terminally on slender rhizomes; roots very thin, less than 0.5 mm. thick. *Leaves* 2-3, (-3-4 under cultivation), very narrow, 12-17-18 cm. long, 1-1.5 mm. wide, slightly canaliculate on upper side, under side striated; sheathing below to form a narrow deciduous neck, to 4 cm. long, 2 mm. in diam. *Scape* to 18 cm. long, very slender, 1-1.5 mm. in diam., green. *Spathe* monophyllous, lanceolate, inclosing the flower buds, later splitting at one side by pressure of expanding buds, 6 mm. long. *Umbel* 4-7-flowered; flowers very small, not opening widely, white, setepals keeled green to brownish. *Pedicels* about 9 mm. long at anthesis, elongating to about 11 mm. thereafter. *Perigone:* tepals lanceolate; setepals 6 mm. long, 2.25 mm. wide, acute; petepals 6 mm. long, 2 mm. wide, acute. *Stamens:* filaments shorter than the tepals, 3 mm. long, anthers 1 mm. long. *Ovary* 1.25 mm. long, 1.5 mm. in diam.; style very slender, slightly over-topping the stamens.

Range.—Known only from the nomenifer location on Mexican Highway 15, K 23, east of Morelia, Michoacan, in the mountains.

Notes.—This most interesting little species ranks among the smallest Mexican Alliums. It is difficult to maintain under cultivation, unless the cultural requirements are known. All, except three of the bulbs collected by Dr. Howard were lost due to growing them in a sandy soil which was humus-poor. Three were saved by transferring them to a humus-rich soil, after it was noted that the bulbs were gradually disappearing without a trace in the sandy soil. The bulbs flowered later (September 5—October 15) under cultivation at La Jolla, Calif. than in the natural habitat where they were past flowering in early September.

CHROMOSOMES OF **ALLIUM EUROTOPHILUM** WIGGINS

LEE W. LENZ
Rancho Santa Ana Botanic Garden

During the summer of 1969 Dr. Hamilton P. Traub sent the author seeds of two forms of *Allium eurotophilum* and requested that chromosome counts be made. Seeds placed on moist filter paper in petri dishes germinated readily. Root tips were pretreated for three hours at 12° C in a .004 M solution of 8-Quinolinol (Eastman Organic Chemicals) to which was added one drop of naphthalene monobromide per vial. They were fixed in 3:1 absolute alcohol and acetic acid and stained with aceto-orcein. Both forms of the species submitted showed 14 somatic chromosomes (see Fig. 17) and in this respect they are consistent with other New World alliums of the subgenus *Amerallium,* all of which possess a base number of $n=7$. Base numbers of the Old World species, and one North American species, *A. tricoccum* Ait. ($2n=32$), of the subgenus *Allium,* are $n=8$, 9, and 10. The chromosomes of *A. eurotophilum* are all long metacentric, or near metacentric, and there are two pairs with satellites, one of them regularly showing a tandem arrangement.

According to Traub, (pers. com.) the seed came from bulbs collected by Dr. Reid Moran (Moran, 15330) July 21, 1968, where they were growing in shade on the steep east slope of Cerro ''2828'', an east run, Sierra San Pedro Mártir, State of Baja California. The altitude given was 2800 m. The species was first described by Ira Wiggins from material collected in the Sierra San Pedro Mártir at 2800 m. where it was growing in deep mucky leafmold in a shaded canyon. According to

Wiggins its affinity is with the widely distributed *A. validum* S. Wats. and it favors the habitat of that species. Chromosome numbers reported for *A. validum* are 2n=28 & 56.

According to Traub, *eurotophilum* is remarkable among alliums in being the only one known to him showing recurrent blooming.

NOTE.—The photo-print for Fig. 17 was lost in transit to the engraver; it will be reproduced in the *1971 PLANT LIFE.*

PLANT LIFE LIBRARY—continued from page 48.

BERNHARD EDWARD FERNOW, A STORY OF NORTH AMERICAN FORESTRY, by Andrew Denny Rogers III. Facsimile of the 1951 Edition. Hafner Publishing Co., 31 E. 10th St., New York, N. Y. 10003. 1968. Pp. 623. Illus. $11.00. This book details a most interesting biography of Fernow, who was the first professional forester in North America. When he arrived from Germany, a forester was classed as a sort of Robin Hood. Today forestry is a recognized branch of biology, and there are 18,000,000 acres of forest reservations in the United States and Canada. All of these advances cannot be credited to Fernow, but he was the leading American forester from 1876 to his death in 1923. This fascinating story of his life is told in detail in this book. Highly recommended to all interested in plant science and conservation.

"NOBLE FELLOW", WILLIAM STARLING SULLIVANT, by Andrew Denny Rogers III. Facsimile of the 1940 Edition. Hafner Publishing Co., 31 E. 10th St., New York, N. Y. 10003. 1968. Pp. 361. Illus. $9.50. This book details the fascinating biography of William Starling Sullivant (1803—1873), one of the early and most distinguished characters of early North American science. He became the "father" and foremost authority on the study of Bryology, the science of mosses, without a superior anywhere in the world during the period of his life. Details of his contributions to the scientific world and a complete list of the mosses he named and described are included. Very highly recommended to all interested in plant science.

A SHORT HISTORY OF BOTANY IN THE UNITED STATES, edited by Joseph Ewan. Hafner Publishing Co., 31 E. 10th St., New York, N. Y. 10003. 1969. Pp. 174. $7.50. Starting with a calendar of events (chronology) beginning c. 300 B. C. and ending with 1968, and the early history of botany in the United States, by the editor, this interesting book contains brief articles by twelve authorities on the various phases of plant science in the United States, morphology and anatomy, genetics and cytology, plant physiology, etc. Highly recommended to all interested in plant science.

THE ALGAE AND THEIR LIFE RELATIONS, by Josephine E. Tilden. Facsimile of the 1937 Edition. Hafner Publishing Co., 31 E. 10th St., New York, N. Y. 10003. 1968. Pp. 550. Illus. $13.50. This facsimile reprint of Prof. Tilden's outstanding synthesis of knowledge about the algae will be welcomed. The arrangement of all of the material in an orderly fashion is a real achievement. Terms have been simplified and reduced in number, and a series of life cycle diagrams have been included with the objective of clarifying many obscurities. The topics discussed include hypotheses concerning the phylogeny of the algae; distribution of the algae; classification of the kinds of algae; the problem of algal control; algal foods for animals and man. Very highly recommended to all interested in the algae.

PLANT LIFE LIBRARY—continued on page 104.

REGISTRATION OF NEW AMARYLLID CLONES

Mr. W. D. Morton, Jr., *Emeritus Registrar*

Mr. James E. Mahan, *Registrar*

Mrs. Emma D. Menninger, *Associate Registrar*

This department has been included since 1934 to provide a place for the registration of names of cultivated **Amaryllis** and other amaryllids on an International basis. The procedure is in harmony with the International Code of Botanical Nomenclature (edition publ. 1961) and the International Code of Nomenclature for Cultivated Plants (edition publ. 1958). Catalogs of registered names, as well as unregistered validly published names, will be published from time to time as the need arises. The first one, "Descriptive Catalog of Hemerocallis Clones, 1893-1948" by Norton, Stuntz and Ballard was published in 1949. This may be obtained at $5.00 prepaid from: Dr. Thomas W. Whitaker, Executive Secy., The American Plant Life Society, Box 150, La Jolla, Calif. Catalog of Hybrid Nerine Clones, 1882-1958, by Emma D. Menninger; and Catalog of Brunsvigia Cultivars, 1837-1959, by Hamilton P. Traub and L. S. Hannibal, were published in 1960 Plant Life, with additions to both in Plant Life 1961. In Plant Life 1961, the first edition of The Genus X Crinodonna was published which serves also as a catalog of cultivars. In Plant Life 1964, the first edition of "Catalog of Hybrid Amaryllis Cultivars, 1799 to Dec. 31, 1963" was published. Other catalogs of cultivated amaryllids are scheduled for publication in future issues.

The registration activity of the American Plant Life Society was recognized when at the XVIth International Horticultural Congress, Brussels, 1962, the Council of the International Society for Horticultural Science designated the American Plant Life Society as the Official International Registration Authority for the cultivars of **Nerine**; and this was extended to include all the **Amaryllidaceae** cultivars, excepting **Narcissus** and **Hemerocallis**, at the XVIIth International Horticultural Congress, 1966.

Only registered named clones of Amaryllis and other amaryllids are eligible for awards and honors of the American Amaryllis Society at Official Amaryllis Shows.

Correspondence regarding registration of all amaryllids such as **Amaryllis, Lycoris, Brunsvigia, Clivia, Crinum, Hymenocallis,** and so on should be addressed to Mr. James E. Mahan, Registrar, 3028 Palmyra St., New Orleans, Louisiana 70119. The registration fee is $2.00 for each clone to be registered. Make checks payable to American Plant Life Society.

REGISTRATION OF NEW AMARYLLIS CLONES, 1969

Registered by Ludwig & Co., Hillegom, Holland.

'Bianca' (Lud. 1969) R; A-878; D-8; U-4 fld.; 16″-18″ h.; 4″-5″ diam.; pure white with greenish yellow throat; spr. and winter.

'Nostalgia' (Lud. 1969) R; A-879; D-5 B; U-4 fld.; 26″-28″ h.; 9″-10″ diam.; darkest oxen-blood red with darker cherry red glossy throat; spr. and win.

'Orange Majesty' (Lud. 1969) R; A-880; D-5 A; U-4 fld.; 26″-28″ h.; 8″-10″ diam.; solid orange (nasturtium red) with only slightly darker throat; spr. and win.

'Takarasuka' (Lud. 1969) R; A-881; D-5 A; U-4 fld.; 26″-28″ h.; 8″-9″ diam.; bright brick red with a suggestion of salmon orange; spr. and win.

'Wedding Bells' (Lud. 1969) R; A-882; D-5 A; U-4 fld.; 28″-30″ h.;

9″-11″ diam.; pure white with yellowish throat; spr. and win.

Registered by Walter R. Latapie, New Orleans, La.

'Hilda Latapie' (Lat. 1969) R; A-876; D-7; U-3 fld.; 14″ h.; 6″ diam.; white with faint cherry red streak each side of mid-rib, inner throat green; spr.

'Walter Latapie' (Lat. 1969) R; A-877; D-7; U-4 fld.; 17″ h.; 6″ diam.; blood red (820) with faint white rib running from midway down center of petal into throat; spr.

Registered by Milo C. Virgin, Covington, La.

'Belle Bianca' (Vir. 1969) R; A-883; D-8; U-4 fld.; 16½″ h.; 4″ diam.; pure white with apple green throat; spr.

Registered by G. C. van Meeuwen & Sons N. V., Heemstede, Holland.

'Athos' (VM 1969) R; A-884; D-5 A; U-4 fld.; 20″-24″ h.; 6″ diam.; blood red solid color; spr.

'Balthasar' (VM 1969) R; A-885; D-5 A; U-4 fld.; 20″-24″ h.; 7″ diam.; solid blood red with petals ribbed; spr.

'Baruta' (VM 1969) R; A-886; D-5 A; U-4 fld.; 24″-28″ h.; 6″ diam.; solid dark red; spr.

'Cicero' (VM 1969) R; A-887; D-5 A; U-4 fld.; 24″-28″ h.; 6″ diam.; solid orange red; spr.

'Cupido' (VM 1969) R; A-888; D-5 A; U-4 fld.; 24″-28″ h.; 5″ diam.; salmon pink with white stripe, white center into throat, upper petals reddish to the center; spr.

'Glorious Victory' (VM 1969) R; A-889; D-5 A; U-4 fld.; 20″-24″ h.; 7″ diam.; salmon orange, petals light at edges and darker at center; spr.

'Gondibar' (VM 1969) R; A-890; D-5 A; U-4 fld.; 24″-28″ h.; 5″ diam.; blood red with darker center into throat; spr.

'La Paloma' (VM 1969) R; A-891; D-5 A; U-4 fld.; 20″-24″ h.; 7″ diam.; light salmon-pink with light red veining on petals coming from center; spr.

'Leticio' (VM 1969) R; A-892; D-5 A; U-4 fld.; 24″-28″ h.; 7″ diam.; solid orange red; spr.

'Loveliness' (VM 1969) R; A-893; D-5 A; U-4 fld.; 20″-24″ h.; 7″ diam.; light salmon-pink with red on the upper petals; spr.

'Parsifal' (VM 1969) R; A-894; D-5 A; U-4 fld.; 20″-24″ h.; 6″ diam.; bright red with orange glow; spr.

'Superba' (VM 1969) R; A-895; D-5 A; U-4 fld.; 20″-24″ h.; 7″ diam.; dark blood red; spr.

'Van Meeuwen's Mont Blanc' (VM 1969) R; A-896; D-5 A; U-4 fld.; 24″-28″ h.; 6″ diam.; pure white with light green in center toward throat; spr.

'Vulcanus' (VM 1969) R; A-897; D-5 A; U-4 fld.; 20″-24″ h.; 7″ diam.; light bright red with orange center toward throat; spr.

Registered by Harry DeLeeuw Co., Ltd., South Africa.

'Majuba' (HDL 1969) R; A-898; D-5 B; U-4 to 5 fld.; 15″ h.; 6½″ diam.; scarlet (HCC 19), foliage coming together with stems.

'Kalahari' (HDL 1969) R; A-899; D-5 A; U-3 to 4 fld.; 15″ h.; 7½″ diam.; Rose opal (HCC 022).

'Coral Seas' (HDL 1969) R; A-900; D-5 A; U-3 to 4 fld.; 16″-17″ h.; 7″ diam.; Turkey red (HCC 721).

'African Sunset' (HDL 1969) R; A-901; D-5 A; U-4 to 5 fld.; 16″-17″ h.; 7½″ diam.; Capsicum red (HCC 715) foliage coming together with stems.

'Rio Grande' (HDL 1969) R; A-902; D-5 A; U-4 to 6 fld.; 11″-12″ h.; 6″ diam.; Signal red (HCC 719).

'Camp Fire' (HDL 1969) R; A-903; D-5 A; U-4 fld.; 16″ h.; 6″ diam.; scarlet (HCC 19).

'Calabash' (HDL 1969) R; A-904; D-5 A; U-3 fld.; 17″ h.; 6½″ diam.; crimson (HCC 22) veined with white.

'Assegai' (HDL 1969) R; A-905; D-5 A; U-3 to 4 fld.; 20″ h.; 7½″ diam.; scarlet (HCC 19).

'Watusi' (HDL 1969) R; A-906; D-5 A; U-3 to 4 fld.; 13″ h.; 6″ diam.; carmine (HCC 21).

'Masai' (HDL 1969) R; A-907; D-5 A; U-4 fld.; 18″ h.; 7″ diam.; white with small scarlet veins near throat of three top tepalsegs.

'Bambara' (HDL 1969) R; A-908; D-5 A; U-3 to 4 fld.; 13″ h.; 7″ diam.; signal red (HCC 719).

'Barotse' (HDL 1969) R; A-909; D-5 A; U-4 to 5 fld.; 21″ h.; 7″ diam.; light cardinal red (HCC 822/3).

'Ashanti' (HDL 1969) R; A-910; D-5 B; U-4 fld.; 14″ h.; 7″ diam.; orient red (HCC 819).

'Bush Fire' (HDL 1969) R; A-911; D-5 A; U-4 to 6 fld.; 14″ h.; 7″ diam.; light Indian orange (HCC 713).

'Festival' (HDL 1969) R; A-912; D-5 A; U-3 to 5 fld.; 14″ h.; 6½″ diam.; scarlet (HCC 19).

'Simba' (HDL 1969) R; A-913; D-5 A; U-3 to 4 fld.; 18″ h.; 8″ diam.; Dutch vermilion (HCC 717).

'El Toro' (HDL 1969) R; A-914; D-5 B; U-3 to 4 fld.; 17″ h.; 7″ diam.; poppy red (HCC 16).

HYBRID BRUNSVIGIA CLONE

Registered by Hamilton P. Traub, 2678 Prestwick Court, La Jolla, Calif.

'Early Hathor'. Similar to the later-flowering white 'Hathor' and its seedlings. Flowers in late July in southern California. Originated as a rare solitary recombination among many seedlings obtained by crossing other hybrid *Brunsvigia* clones with the clone 'Hathor'. The genes for early-flowering were derived originally from the early-flowering *Brunsvigia major* Traub which begins to flower in late July in southern California.

CYRTANTHUS CLONE

Registered by Alek Korsakoff, Jacksonville, Florida.

'Meta's Pride' (Korsakoff, 1969). Plants up to 47 cm. high. Very vigorous, better in habit of growth than either parent; intermediate but closer to seed parent in the floral characters. Flowers 3 cm. across; tepaltube and back of tepalsegs carrot red (HCC 612/1); tepalsegs saturn red (HCC 13/1) inside. This is a cross between **C. mackenii** (sulfur yellow, HCC 1) ♀ x **C. sanguineus** ♂.

'Janis Korsakoff' (Kor. 1969) R; CY-4; U-7 fld.; 45 cm. h.; 22mm. diam.; marigold orange (11/3) in front and on back edges of petals, with nasturtium red (14/2) on keels. This is a clone of the hybrid **Cyrtanthus x henryae.**

REGISTRATION OF CLONES—continued on inside back cover.

CONTRIBUTIONS TO SOUTH AMERICAN AMARYLLIDACEAE III *

PEDRO FELIX RAVENNA

The present series includes new species, new combinations and miscellaneous notes in the genera *Amaryllis, Rhodophiala, Habranthus, Zephyranthes, Stenomesson, Griffinia* and others. Most of the plants were gathered and studied by me, during collecting trips through Latin America. A few species were described on the basis of dry specimens. All the bulbs collected were introduced in my collection of living plants for subsequent study.

In addition to my private herbarium, I have examined specimens of the following Institutions: B, BA, BAA, BAB, BHMG, DPN, HBR, HH, LIL, M, NY, PACA, RB, SP, TRUX, UB.

I. STUDIES IN THE GENUS AMARYLLIS

Amaryllis petiolata

Correct name of a misidentified species mainly from Argentina.

In 1956, during a student's excursion to Punta Lara (near the city of La Plata), I saw for the first time an isolated clump of a delightful "miniature" *Amaryllis* which I provisionally determined as *Hippeastrum flammigerum* Holmb. At that time we were supervised by the memorable Prof. L. R. Parodi. Punta Lara, in the province of Buenos Aires, is the southernmost area of gallery forest, at present in accelerated process of destruction because of tourism.

After that occasion, I was surprised in seeing the plant cultivated in several gardens of the city of Buenos Aires. Moreover, I knew that the same plant was collected alive in the Delta of the Paraná River (Entre Ríos part) by Prof. A. Burkart. In the Darwinian Institute I also found dry specimens from the latter area, and also others collected by Hauman in the Martín García Island and by Hicken from Holmberg's collection of living plants.

Searching in the literature, I realized that the species was cited for the first time in Argentina by Holmberg (1903, p. 157-158), as *Hippeastrum rutilum* Herb., and afterwards, under the same specific name, by Hauman & Vanderveken (1917, p. 282) and Cabrera (1953, p. 148). Following this concept, I began to determine herbarium specimens, with some reluctance, as *Amaryllis striata* Lam. (syn.: *Hippeastrum rutilum* Herb.). At that time I had not had the opportunity of studying the latter species at Río de Janiero, where it was originally collected.

In September 1965 I saw the true *Amaryllis striata* Lam., for the first time, growing gaily on the rocky cliffs near Leblon (a Río de

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* The second series of this work (see Plant Life vol. 25, 1969), was wrongly numbered as the third.

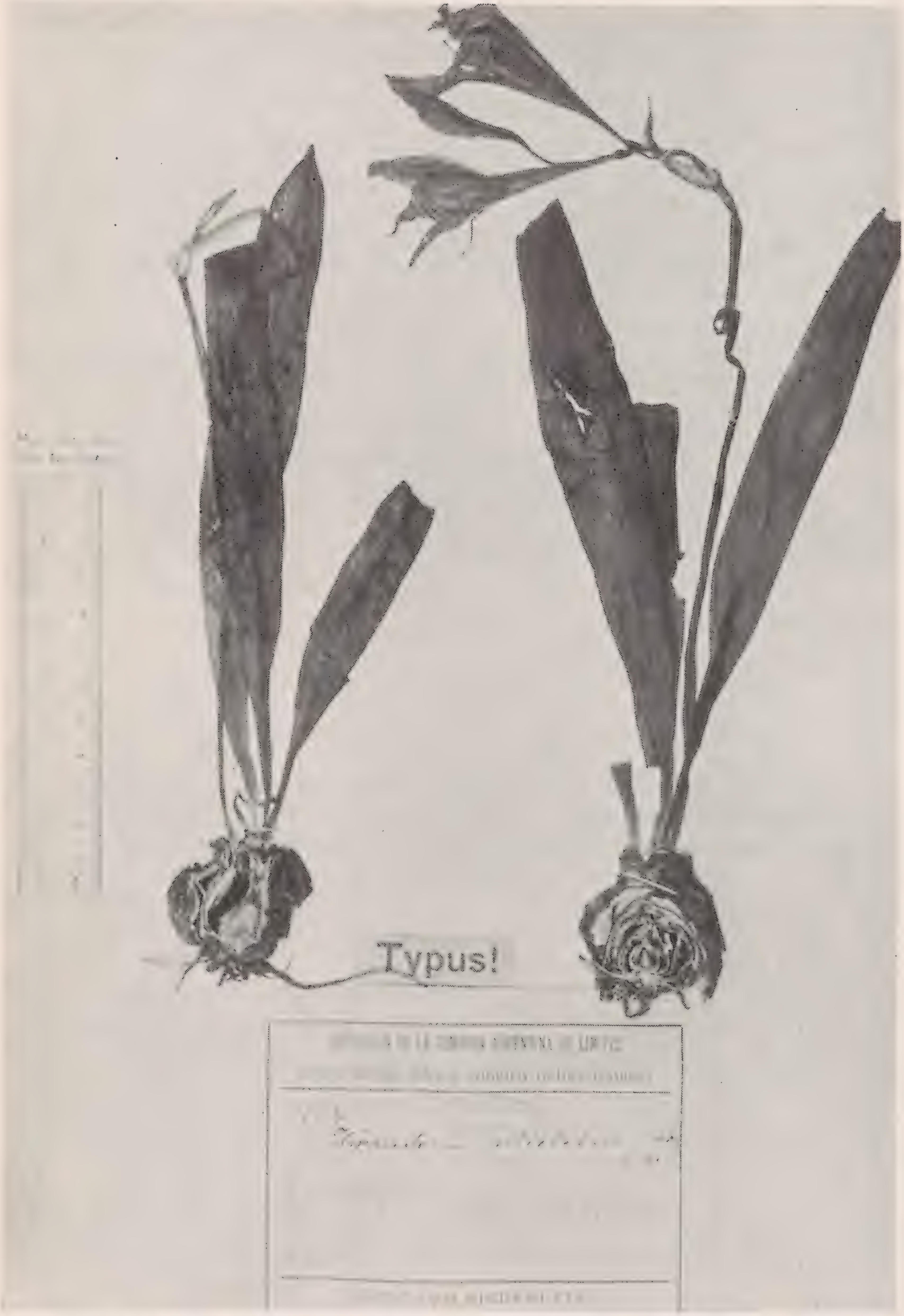

Fig. 18. The type-sheet of *Amaryllis petiolata* (Pax) Traub et Uphof.

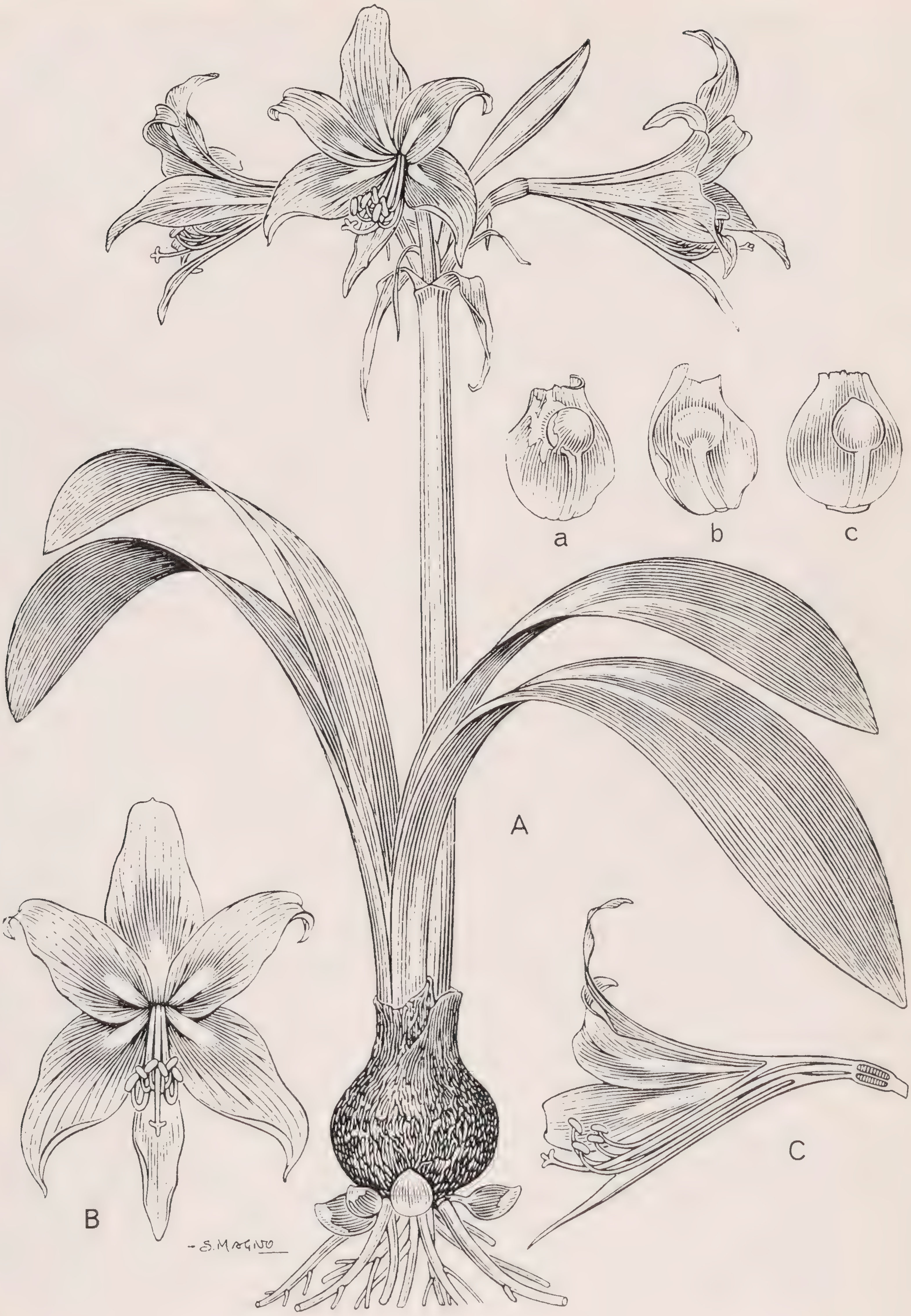

Fig. 19. *Amaryllis petiolata* (Pax) Traub et Uphof. *A,* plant in flower (X ⅓); *B,* flower, front view (X 0.5); *C,* longitudinal cut of flower, showing insertion of stamens and style; *a, b* and *c,* three aspects of generation of a bulblet (*b,* view from the adaxial face of the tunic). Drawn by S. Magno.

Janiero quartier) and also at the Rasa Island. The latter is a place which was explored in early times by botanists like Banks, Commerson and Martius. It is quite possible that Commerson was the collector who brought the plant to Lamarck for classification. As a result of my trip, it became clear that Lamarck's species was different from the Argentinian one. Thus I turned back to my previous concept in considering the latter as *Amaryllis flammigera* (Holmb.) T. & U. This fact was communicated to people who were working on this plant.

On the other hand, the problem concerning the identity of *Amaryllis petiolata* (Pax) T. & U. was still unsolved. In 1965, Dr. Gómez Rüppel, from Mendoza, went to the original location (in the province of Corrientes) in order to try to find this plant and introduce it into cultivation. He was unable to find the type-location of ''Monte Justo'', near Santo Tomé, but he did find a place called ''Capón Susto'' [From Dr. Gomez Rüppel correspondence]. ''Monte'' and ''Capón'' [Native term of Guaraní origin, composed from ''caá'', plant or tree and ''paú'', place: place with trees or wood], are both native terms for wood. In the neighborhood of Santo Tomé, Dr. Gomez Rüppel found an *Amaryllis* which Dr. Traub named *A. argilagae.* This proved to be identical with *A. flammigera* (Holmb.) T. & U.

In 1967 I decided to request on loan from the Botanical Museum of Berlin-Dahlem, the type-specimen of *Amaryllis petiolata* (Pax) T. & U. (Arg., Corrientes, Santo Tomé, Monte Justo, leg. Niederlein). There were strong possibilities that it could have been burned during the last war. Fortunately, it had been saved, along with many other types of Monocotyledones. When it reached my hands, a previous supposition became true: the specimen agreed in every respect with the plant collected in the province of Misiones by Holmberg, and named by him *Hippeastrum flammigerum.* Another point of interest was noted: on the sheet label was written *Monte Susto,* which means something like ''frighting wood'', and not ''Monte Justo''. Thus, the plant was originally collected in the same place detected by Dr. Gómez Rüppel as ''Capón Susto''. In this manner a long time misidentified species of *Amaryllis* has been properly named.

The same plant was collected alive on the way to Puerto Stroessner, in Paraguay, during the excursions organized to that country in 1967, by the Sociedad Argentina de Botánica. Some time later it flowered in Buenos Aires. According to Spegazzini (1917, p. 42) it was also found in the Isla Hornos (Republic of Uruguay). In 1967 I found a few plants in the wood relics of Isla Martín García.

It is necessary to call attention to the reader, that the incorrect name''Hippeastrum rutilum''has been used very recently for this species by Naranjo in his excellent work on the caryology of some *Amaryllidaceae,* and by Fabris (1969) in the Flora de la Provincia de Buenos Aires.

Amaryllis petiolata (Pax) T. & U. (Figs. 18 and 19)

Traub et Uphof, Herbertia 5: 126-127. 1938; *Hippeastrum petiolatum* Pax, Engler Bot. Jahrb. 11: 330. 1890; *Hippeastrum flammigerum* Holmberg, An. Mus. Nac. Buenos Aires, Ser. III. 5: 158. 1903; *Amaryllis flammigera* (Holmb.) Traub et Uphof, Herbertia 5: 127. 1938; *Amaryllis argilagae* Traub, Pl. Life 23: 57. 1967.

Plant about 30-45 cm. high. Bulb almost globose, about 45-60 mm. in diam., covered with dark brown coats, with a very short or obsolete pseudo-neck, very prolific, bulblets almost round, often compressed, about 10-20 mm. wide, originated on the bulb tunics. Leaves 2-3 at flowering time, loriform to oblanceolate-petiolate, often somewhat falcate, laxly spreading, striated, a dark green, almost flat toward the apex, about 17-40 cm. long, to 48 mm. wide. Scape cylindrical or sometimes compressed, a pale green, somewhat pruinose. Spathe 2-4-flowered; valves lanceolate, almost equal, marcescent, about 20-42 mm. long; inner bracts few, linear. Pedicels about 24-54 mm. long. Flowers horizontal or sometimes declined, scarlet passing to coral-red with age, with a yellowish star at the throat, about 67 mm. long and 62 mm. in diameter. Ovary narrowly obovoid, obtusely triangular, a brownish green, to 6 mm. long, 4.8 mm. in width. Tepals oblanceolate, connated for 10 mm., recurved, somewhat undulated, the outer ones about 62 mm. long, 19 mm. wide, apiculate-velutinous, inner lateral to 61 mm. long, 15.5 mm. wide, the lower inner horizontal, narrower, about 59 mm. long, 11 mm. wide. Filaments declined, slightly incurved at their apex, lateral episepal ones to 32 mm. long, upper episepal about 34-35 mm. long, lower epipetal to 39 mm. long, the lateral epipetal ones about 42 mm. long. Style declined, to 60 mm. long; stigma trifid, its lobes about 2.5-3 mm. long.

Hab.—Gallery forests of the Río de la Plata (including the islands), and both the rivers Uruguay and Paraná in the Argentinian Mesopotamia; also in the Republics of Paraguay and Uruguay. Apparently it does not grow in the Brazilian territory. In Argentina it has been found, except for more or less extended gaps, from Punta Lara (prov. of Buenos Aires) to Iguazú (prov. of Misiones).

Specimens: Argentina: Ex hort. Holmberg; leg. Hicken (SI). Ex prov. Misiones, Culta in Hort. Bot. Bonariae, I-1902; leg. C. Spegazzini? (LPS 19464). Prov. of Entre Ríos, Delta inferior, Arroyo Martinez; leg. Burkart 27586, 6-XI-1959. (SI) Cult. in SI; leg. ipse 15063, 13-X-1944 (SI). Idem; leg. ipse 27586, 14-XI-1956. Uruguay Republic, dept. of Colonia, Riachuelo; leg. Cabrera 13633, 1-X-1960 (LP). Montevideo; leg. Felippone 3373 (SI).

Amaryllis petiolata was misplaced by Pax in subgenus *Habranthus* (= genus *Habranthus*).

The species never produces fruits under cultivation and apparently not even in the wild state. According to Naranjo (1969), the plant has a chromosome complement of 2n=55, and the pollen is 95 per cent self-sterile.

The bulb produces a great number of bulblets. These are nearly round, somewhat compressed, not more than 20 mm. in width. How are they generated? We may immediately understand that it is an unusual process. In fact, they are originated *on* the bulb tunics, apparently just beneath the epidermis. At the time when they are produced (Summer-Autumn), it is possible to see that the bulb is somewhat irregular in shape. Removing the outer tunics, it can be seen that the inner ones bear in almost all cases, one bulblet. This is attached almost always at the middle of the tunic. Below it there is an enlarged vascular strand system which connects the base of the bulblet to the corm of the bulb. This kind of a cord persist a time after the tunic has already dried

Bulblets have a dormant period from the time when they are generated to the next Spring (sometimes almost a year). Moreover, their outer coat is often hard and completely closed around. In this way the bulblets can resist immersion for long time during floods, which are not unfrequent in the Argentinian Mesopotamia. Rivers may carry them for long distances until they take root in some other place.

Amaryllis striata has the same type of vegetative proliferation, even if not so profuse. In this species the bulblets probably fall over the cliffs or maybe they are carried off by torrential rains. Similar cases are found in some *Liliaceae* as *Ornithogalum caudatum* Jacq. and *Scilla argentinensis* Haum. I prefer to use this name in place of *Camassia biflora* (Ruiz & Pav.) Cocucci (1969).

Obviously, this kind of proliferation saved *A. petiolata* from extinction. But, how did the species originate? Naranjo (1969, p. 78) says that it possibly is a hybrid between a hexaploid (2n=66) and a tetraploid (2n=44). In this case, which could be its parents? The closest species are: *Amaryllis striata* Lam. (2n=44), from Río de Janeiro, and *A. aglaiae* Cast. (2n=22), from the mountains of Tucumán. Both plants are separated from ours by efficient barriers: the southern plateau of Brazil (Serra Geral) and the Chaco Region in Argentina. It is possible that an answer of this problem could be found in the study of the following subspecies.

Amaryllis petiolata (Pax) T. et U.
ssp. **cochunensis** Rav. **ssp. nov.**

A subspecies petiolata bulbi cataphyllis haud bulbilligenis, tubo perigonii leviter breviori, differt.

Differs from subspecies petiolata on account of the tunics, which does not produce bulblets, and the perigone tube somewhat shorter.

Hab.—In woods of the southern part of the Aconquija mountains, mainly in the Río Cochuna region, prov. of Tucumán, Argentina.

Specimens: Culta in Bonaria ex bulbis collectis in sylvis regionis flumini Cochuna, dep. Chicligasta Tucuman Argentinae; leg. Ravenna 1002, prim. 1961 (typus in Herbario Ravenna).—Tucumán, dept. Chicligasta, Las Pavas, 2000 m.; leg. P. Joergensen II-1911 (BAB 35053).—

Idem ibid; leg. ipse 109, X-1912 (BAB).—Idem ibid, 1200 m. leg. S. Venturi 4556, 22-IX-1926 (LP, LIL). Idem, El Clavillo, al pié de la cuesta; leg. Fabris 6605, X-1966 (LP).

The attention of genetists is drawn to the necessity of studying the chromosomes of this subspecies. The plant is cultivated in the United States (see Pl. Life 1965:) from bulbs sent by Dr. Gómez Rüppel.

Except by the fact that the bulb tunics do not bear bulblets and that the perigonium tube is somewhat shorter, it is similar in every respect to the type.

Type Species of Subgenus **Macropodastrum**

The application of the name *Amaryllis elegans* Spreng. (1815). to the type-species of the subgenus *Macropodastrum* is relatively recent. In fact, the first reference in connection with it, is found in the Index Kewensis. The name there is treated as a synonym of "*Hippeastrum solandriflorum* Herb.; Traub and Uphof (1938) accepted this statement, but due to priority they standardized *Amaryllis elegans,* a name which until then had never come into use.

It must be noted that Herbert's *Hippeastrum solandriflorum* (1821), is a variant of the name *Amaryllis solandraeflora* Lindl. (1821), but they both should probably be regarded as different. Nevertheless, as they appeared in the same year and, being Lindley's name in the proper genus, the latter must be selected. Moreover, *solandraeflora* is a correct epithet under Latin grammar.

The original diagnosis of *A. elegans* states as follows: "A. spatha multiflora corollis cernuis subpedicellatis intus glabris, laciniis alternis uncinatis, scapo tereti, foliis lineari-lanceolatis". This descriptive phrase does not show any special discrepancy, excepting perhaps the character "spatha multiflora". In fact, our plant is almost always two-flowered or rarely 4-flowered. Notwithstanding, in the discussion Sprengel says: "Proxima *A. vittata,* sed hujus pedicelli longiores, corolla intus scabrido-punctata, radices laciniarum exteriorum interiorum margini adnatee, quod secus in nostra. Corolla alba striis roseis elegantissime picta. *A. belladonna* pro cujus varietate habetur, differt petalis interioribus basi ciliatis, scapo compresso, corollis erectis". The translation follows: "Allied to *A. vittata,* but this has longer pedicels, the corolla with scales within, the lower part of the outer tepals adnate by its margins to the inner ones, which is quite at variance from our plant. Corolla [perigone] white very elegantly pink-striped. We received it as a variety of *A. belladonna;* this one differs by its scaled inner segments, its compressed scape, and the erect corolla[?]."

We can see above two points worthy of consideration: a) Sprengel says that the segments of *A. elegans* are not connate by its margins as in *A. vittata.* If this is true, *A. elegans* cannot be identified as our plant, because concrescent tepals continued by a distinct, often very long, perigone—tube, is the principal feature in the subgenus *Macropodastrum.*

(b) ''Corolla [perigone] white very elegantly pink-striped''. This is, in my opinion, the definitive evidence that Sprengel's name was applied to a different species, which could even pertain to another genus. The name ''elegans'' was obviously chosen because of the ''white very elegantly pink-striped flowers''. The type-species of *Macropodastrum* has greenish-white, not at all striped, flowers; it is quite a distinctive species.

In order to avoid any possibility of mistake, the type-specimen of *Amaryllis elegans* Spreng. was requested from several European Institutions, including Kew Gardens and the Botanical Museum of Berlin-Dahlem. I was informed that there is no specimen of that species in their herbaria. Possibly it never existed or maybe it was burned in the Berlin Museum during the war.

Due to the facts above mentioned, the name *Amaryllis solandraeflora* Lindl. must be restored. On the other hand *Amaryllis elegans* Spreng. is proposed here as ''nomen dubium''.

Amaryllis solandraeflora Lindl. (Fig. 20)

Lindley, Coll. Bot.: tab. 11. 1821; *Hippeastrum solandriflorum* Herbert, Appendix Bot. Reg.: 31. 1821; *Crinum stapfianum* Kraenzlin, Kew Bull. 1913: 191, Excl. syn. *Amaryllis elegans* Spreng.

Hab.—Central, Western and Northeastern Brazil, apparently also in Venezuela and the Guyanas. I have collected bulbs in Brazil in the following places: Goiás, Serra Dourada, near the town of Goiás (rare); Mato Grosso, Chapada do Amolar, in grassy fields; same State, Xavantina, abundant in sandy places; Piauí, between Oeiras and Floriano, in the caatinga (rare); Maranhão, mun. Pastos Bons, Serra do Caatingerio, in dry slopes (scarce).

Specimens: Brazil, chiefly Province of Goiás, comm. A. Glaziou 22204, 1806 (photo-type of *Crinum stapfianum* Kraenz. from K). Pernambuco, Petrolina, viajem ao ''sertão''; leg. A. Lima 2/9-I-1961 (RB 11357). Goiás, Campos Belos; leg. A. P. Duarte 9488, 24-X-1965 (RB 130246).

A photograph of the type of *Crinum stapfianum* Kraenzl., received from Kew Gardens, revealed that this is a further synonym of *Amaryllis solandraeflora* Lindl.

A new species in subgenus **Omphalissa**

The present beautiful species I discovered in a Garden at Santa Ana do Livramento, Río Grande do Sul. The owner of the house said that it was gathered in wild state, in the south of the State of Santa Catarina. Talking with Dr. P. R. Reitz [Director, Herbario ''Barbosa Rodrígues'', Itajaí, Santa Catarina], he said that apparently the same species was collected by him in the same region. The latter material has not reached my hands yet.

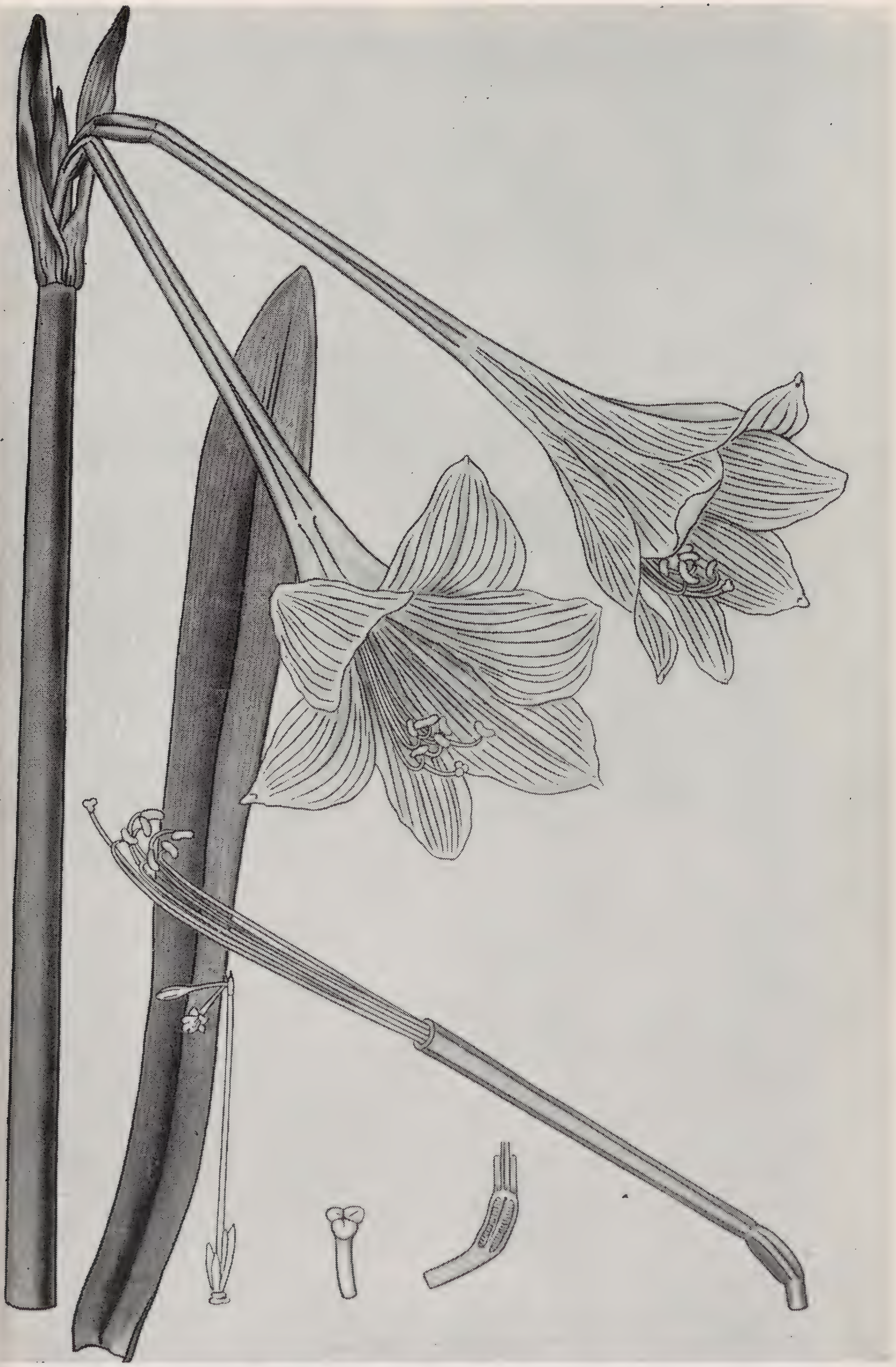

Fig. 20. *Amaryllis solandraeflora* Lindl., photograph from the original illustration (Coll. Bot.: tab. 11, 1821), by courtesy of Kew Gardens.

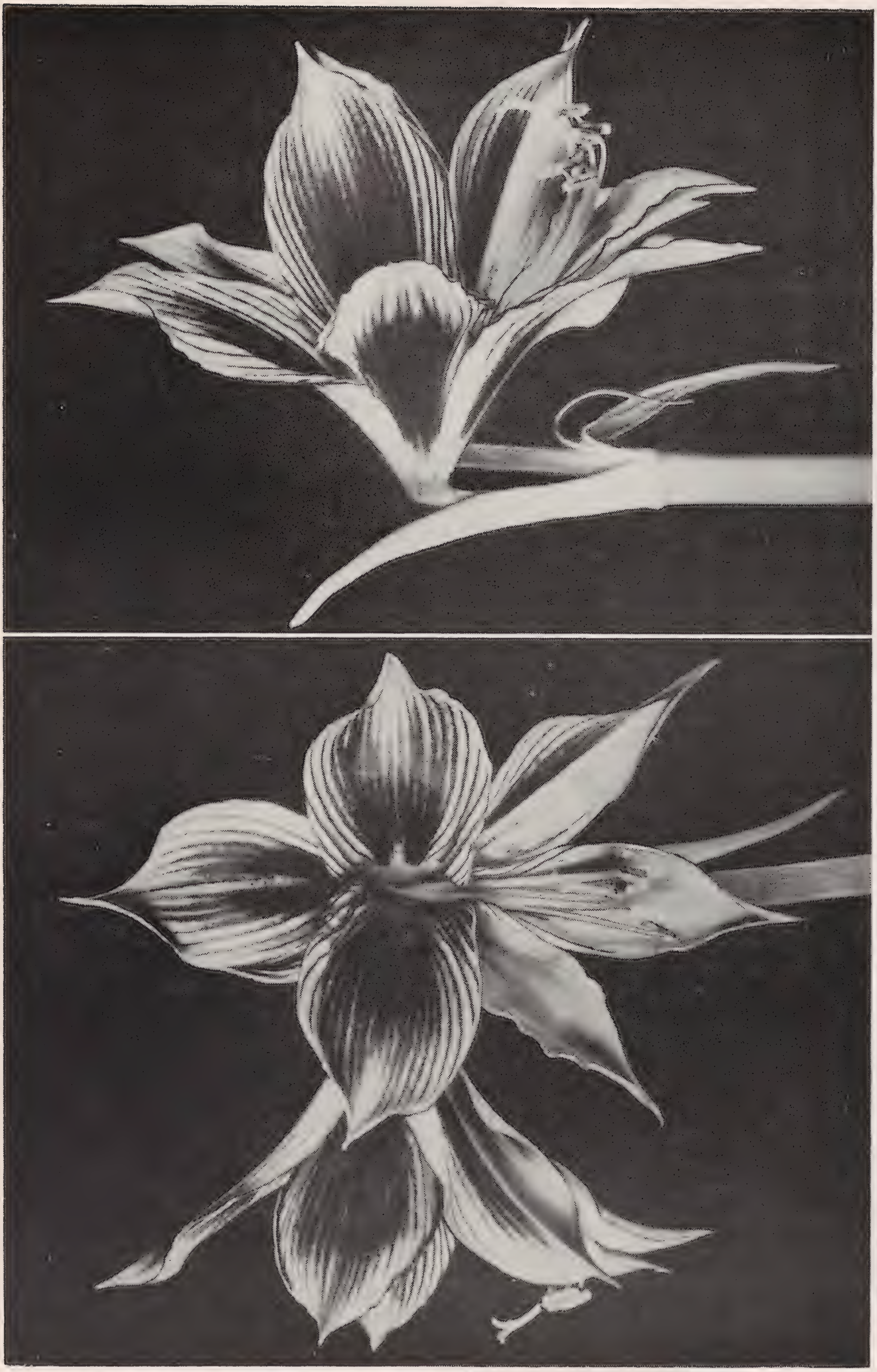

Fig. 21. *Amaryllis papilio* Rav., raised in Buenos Aires from bulbs gathered at Santa Ana do Livramento R. G. do Sul, Brazil; a native of Santa Catarina. *Left*, front view. *Right*, side view.

Amaryllis papilio sp. nov. (Fig. 21)

Planta usque 52 cm. alta. Bulbus ovatus ad 9 cm. longus circ. 55 mm. latis in collo brevi circ. 4-5 cm. longis productus, tunicis cartaceis fusco-ochraceis vestitus. Folia synanthia lorata canaliculata viridia usque quinque ad 30-50 cm. longa circ. 33-37 mm. lata striata recurve patentia. Scapus leviter compressus ad 33 cm. longus leviter pruinosus basin versus purpurescens usque 15-16 mm. latus. Spatha biflora; valvae marcescentes subaequales ad 10-10.5 cm. longae; bractea interior unica linearia ad 7.5 cm. longa. Pedicelli subaequales teretes ad 5.5 cm. longi circ. 6.5 mm. lati. Flores leviter declinati ad lateras valde compressi pallide viridi fusco-rubro-tincti usque 9 cm. longi ad 13.4 in diametro verticale et 12 cm. in diametro horizontale. Ovarium oblongum nitide viride ad 16-18 mm. longum circ. 9-10 mm. latum. Tepala oblanceolata usque 10-11 mm. concrescentia, exteriori-superius ad 10.5 cm. longum circ. 35 mm. latum sordide albo-viridescente insigniter fusco-rubro venatum et tinctum apiculo circ. 5 mm. longo instructum, exteriora lateralia angustiora saepe minus rubro-striata ad 14 cm. longa circ. 27 mm. lata apiculis circ. 6.5 mm. longis instructa, interiora lateralia late oblanceolata ad 9.5 cm. longa circ. 44 m. lata ad margines leviter undulata prope basin viridia dense fusco rubro-tincta et venata, interiori-inferius peracutum ad 10.5 cm. longum circ. 25-28 mm. latum basin versus fusco-rubro-suffusum fasciculum staminorum amplectente ad margines ejusdem colore tinctum. Filamenta declinata stricte fasciculata alba, sepalinum superius ad 8 cm. longum, sepalina lateralia ad 8.2 cm. longa, petalina lateralia ad 9 cm. longa, petalinum inferius ad 9.2 cm. longum. Coronula viridis clausa crenulata. Stylus declinatus superne leviter ascendens albo-viridescens usque 11 cm. longus; stigma trifidus lobis patentes usque 4 mm. longis.

Plant to 52 cm. high. Bulb ovate, about 9 cm. long, 55 mm. in width, produced into a pseudoneck for 4-5 cm.; the outer tunics papery, a dark brown. Leaves synanthious, lorate, canaliculate, green, about five, to 30-50 cm. long, 33-37 mm. broad, striated, recurvely spreading. Scape somewhat compressed, to 33 cm. long, somewhat pruinose, purplish and 15-16 mm. wide toward the base. Spathe two-flowered; the valves marcescent, subequal, to 10-10.5 cm. long; inner bract single, linear, about 7.5 cm. long. Pedicels almost equal, cylindrical to 5.5 cm. long, 6.5 mm. in width. Flowers somewhat declined, laterally rather compressed, a pale green tinged with a dark red, to 9 cm. long, 13.4 cm. in its vertical diameter and 12 cm. in its horizontal diameter. Ovary oblong, a bright green, about 16-18 mm. long, 9-10 mm. in width. Tepals oblanceolate, connated for 10-11 mm., the upper outer to 10.5 cm. long, 35 mm. broad, a greenish white markedly striated and stained with a dark red, its apiculum to 5 mm. long; lateral outer ones narrower, often less red-striated, about 14 cm. long, 27 mm. broad, its apicula about 6.5 mm. long; lateral inner ones broadly oblanceolate to 9.5 cm. long, 44 mm. broad, with somewhat undulate margins, green toward the base and markedly striated or stained with dark red; lower inner very acute

to 10.5 cm. long, 25-28 mm. broad, stained with a dark red toward the base, here sheathing the stamens fascicle, its margins of the same red color. Filaments declined, closely fasciculated, white, the upper episepal to 8 cm. long, lateral episepal about 8.2 cm. long, lateral epipetal to 9 cm. long, lower epipetal about 9.2 cm. long. Basal scales closed around the stamen fascicle, crenulate. Style declined, slightly curved toward the apex, a greenish white, to 11 cm. long; stigma trifid, its lobes spreading to 4 mm. long.

Hab.—South of the State of Santa Catarina, Brazil. Cultivated in Río Grande do Sul (Brazil) and in my collection in Buenos Aires.

Specimens: Cultivated in Buenos Aires from a bulb gathered in the south of the State of Santa Catarina, Brazil (exact locality not known); leg. Ravenna 1000, Nov. 1967 (typus Herb. Ravenna).

This plant is related to *Amaryllis aulica* Ker.; it is easily distinguishable from it because of the laterally compressed flowers of a different color. The name due to the shape of the lower pair of inner tepals which resemble the wing tails of some butterflies of the genus *Papilio;* the brown-red blotches and the general aspect of the flower also reminds a butterfly.

Apparently the same species was found by Dr. Gómez Rüppel near Porto Alegre.

Amaryllis araripina, new species from Pernambuco, Brazil

During explorations in the State of Pernambuco, I discovered a new species in the subgenus *Macropodastrum.* This was found in low elevations, about 5 km SE from the small town of Araripina.

Amaryllis araripina Rav. sp. nov.

Planta usque 90 cm. alta. Bulbus globosus vel subovatus usque 65 mm. latus in collo circ. 5-9 cm. longo productus, tunicis exterioribus fusco-ochraceis obtectus. Folia lorata canaliculata recurve patentia ad 30-40 cm. longa vel interdum ultra circ. 45-55 mm. lata ad apicem obtusa, ad anthesin usque tres. Scapus teres robustus ad 80-82 cm. longus circ. 20 mm. latus. Spatha biflora bivalvata; valvae ad anthesin siccae membranaceo-cartaceae subaequales ad 46 mm. longae; bracteae interiores usque quinque lineari-lanceolatae. Pedicelli ad 42-60 mm. longi. Flores pulchre albi tubum versus leviter ochracei ad 16.5-17.5 cm. longi circ. 74-84 mm. lati. Ovarium obtuso-triquetrum ad 7-8 mm. longum circ. 3.5-4.5 mm. latum. Perigonii tubus ad 90-95 cm. longus. Tepala oblanceolata recurve patentia haud crispato-undulata, exteriora usque 80-84 mm. longa circ. 21 mm. lata apiculata; apiculus circ. 1 mm. longus; interiora subaequilonga usque 22.5 mm. lata acuta. Filamenta fasciculato-declinata ad apicem incurva alba, sepalina lateralia ad 50 mm. longa, sepalinum superius ad 55 mm. longa. Petalium inferius circ. 60 mm. longum, petalina lateralia ad 65 mm. longa. Antherae subreniformes vel sublunulatae ad 5-5.9 mm. longae; pollen luteus. Stylus ex ovario circ. 17-17.5 cm. longus; stigma breviter trifidus, lobis crassiuscaulis paullo recurvatis ad 1.2-1.8 mm. longis.

Plant to 90 cm. high. Bulb almost globose or ovoid about 65 mm. in width, produced into a pseudo-neck for 5-9 cm., the outer coats of a dark brown. Leaves lorate canaliculate, recurvely spreading, about 30-40 cm. long or sometimes longer, 45-55 mm. broad, obtuse, about three at anthesis. Scape cylindrical, robust to 80-82 cm. long, 20 mm. in width. Spathe two-flowered, bivalved; valves dry at anthesis, papery-membranous, almost equal, to 46 mm. long; inner bracts five, linear-lanceolate. Pedicels about 42-60 mm. long. Flowers white, the tube slightly ocraceous, to 16.5-17.5 cm. long, 74-84 mm. in diameter. Ovary obtusely trigonous to 7-8 mm. long and 3.5-4.5 mm. in width. Perigone-tube to 90-95 mm. long. Tepals oblanceolate recurvely spreading, not crisped or undulated, the outer to 80-84 mm. long, 21 mm. broad, apiculate; the apiculum to 1 mm. long; inner subequal to 22.5 mm. broad, acute. Filaments fascicled, declined, incurved at the apex, white, lateral episepal to 50 mm. long, upper episepal about 55 mm. long, lower epipetal to 60 mm. long, lateral epipetal to 65 mm. long. Anthers almost reniform or sumilunate about 5-5.9 mm. long; pollen yellow. Style to 17-17.5 cm. long; stigma shortly trifid, its lobes thickened, somewhat recurved, to 1.2-1.8 mm. long.

Hab.—In shady sandy places, on hills, near the town of Araripina, in the State of Pernambuco, Brazil. It grows near *Cassia* sp. and thorny Leguminosae.

Specimens: In collis 5 km a urbe Araripina civit Pernambuco Brasiliae; leg. Ravenna 165, XII-1962 (typus Herbarium Ravenna).

With pure white flowers and a shortly trifid stigma, this plant comes close to *A. argentina* (Pax) Rav.; the leave are similar to this species. On the other hand the flower shape is quite similar to that of *A. solandraeflora* Lindl.; however, it differs from it on account of the broad recurved leaves, the flower color, and the faintly trifid stigma.

The name commemorates the Araripe Indians, who were the original inhabitants of the region where the plant grows.

The varieties *conspicuum, rubritubum,* and *striatum,* Herbert's names attached to *Hippeastrum solandriflorum* Herb. are transferred to this species. This is done tentatively, because they both cannot be maintained with that species; their morphology agrees reasonably with *A. araripina* Rav.:

Amaryllis araripina Rav. ssp. **conspiqua** (Herb.) Rav. comb. nov.

Hippeastrum solandriflorum Herb. var. *conspiquum* Herbert, Amaryll.: 136. 1837.—*Amaryllis solandraeflora* Lindl. var. *vittata* Lindley, Edwards' Bot. Reg. 11: tab. 876. 1825.—*Amaryllis elegans* Spreng. var. *conspiqua* Traub Amaryllis Manual: 266. 1958.

Amaryllis araripina Rav. ssp. **rubrituba** (Herb.) Rav. comb. nov.

Hippeastrum solandriflorum Herb. var. *rubritubum* Herbert, Amaryll.: 136. 1837.—*Amaryllis elegans* Spreng. var. *rubrituba* Traub, Amaryllis Man.: 266. 1958.

Amaryllis araripina Rav. ssp. **striata** (Herb.) Rav. comb. nov.

Hippeastrum solandriflorum Herb. var. *striatum* Herbert, Amaryll.: 136. 1837.—*Amaryllis elegans* Spreng. var. *striata* (Herb.) Traub, Amar. Man.: 266. 1958.

II. **RHODOPHIALA** NOTES

A new *Rhodophiala* from Brazil is described here. The species was found in Minas Gerais and represents the northernmost record of the genus. Additionally a number of new combinations and new taxa are proposed.

Rhodophiala cipoana Rav. sp. nov.

Planta usque 20-25 cm. alta. Bulbus ovatus ad 35 mm. longus circ. 19-21 mm. latus in collo brevi productus, tunicis exterioribus fusco-ochraceis. Folia ad anthesin incipientia unica vel dua lineari-canaliculata circ. 3-6 mm. lata. Scapus circ. 19-27 cm. longus. Spatha biflora; valvae ad basin liberae marcescentes ad 15-25 mm. longae, bracteis interioris duis setaceis includentes. Flores pedicellati purpurei ad 45-55 mm. longi circ. 38-45 mm. lati. Ovarium obovato-clavatum obtuso-triquetrum ad 4 mm. longum circ. 2.5 mm. latum. Tepala oblanceolata ad 1.4-1.6 mm. connata, exteriora ad 40-56 mm. longa circ. 9 mm. lata apiculata, interiora ad 40-52 mm. longa circ. 9 mm. lata acuta. Filamenta declinata, sepalina lateralia ad 17 mm. longa, sepalinum superius circ. 18-19.5 mm. longum, petalina lateralia circ. 22-26 mm. longa, petalium inferius ad 26-27.5 mm. longum. Antherae versatiles oblongo-reniformes circ. 4.5 mm. longae; pollen loculique lutei. Stylus declinato-ascendens circ. 50 mm. longus. Stigma trifidus lobis recurvatis usque 2.5-3 mm. longis instructus.

Plant to 20-25 cm. high. Bulb ovate about 35 mm. long, 19-21 mm. in width, produced into a pseudo-neck; the outer coats of a dark brown. Leaves incipient at anthesis, single or two, linear-canaliculate, to 3-6 mm. broad. Scape about 19-27 cm. long. Spathe two-flowered; valves free down to the base, marcescent, about 15-25 mm. long; inner bracts two, filiform. Flowers pedicellated, purple, to 45-55 mm. long, 38-45 mm. in diameter. Ovary obovate-clavate, obtusely trigonous, about 4 mm. long, 2.5 mm. wide. Tepals oblanceolate, connated for 1.4-1.6 mm. the outer to 40-56 mm. long, 9 mm. broad, apiculate; the inner about 40-52 mm. long, 9 mm. broad, acute. Filaments declined, lateral episepal to 17 mm. long, upper episepal to 18-19.5 mm. long, lateral epipetal about 22-26 mm. long, lower epipetal to 26-27.5 mm. long. Anthers versatile, oblong-reniform to 4.5 mm. long; pollen yellow. Style declined-ascending about 50 mm. long. Stigma trifid, its lobes recurved, to 2.5-3 mm. long.

Hab.—In sandy quartzitic soil at the top of the Serra do Cipó, State of Minas Gerais, Brazil; I have collected it near the house called "Palacio", at km 122 and 123 of the MG-2 route. It grows near *Trimezia fistulosa* Fost. (*Iridaceae*), *Trimezia* sp., *Trimezia truncata* Rav. ssp.

Pseudotrimezia cipoana Rav. (*Irid.*), *Lychnophora* sp. (*Compositae*), *Poligala* sp., *Barbacenia coccinea* (*Velloziaceae*), *Barbacenia* sp. (Shruby), and others.

Specimens: Brazil, Minas Gerais, mun. Santa Luzia, Serra do Cipó, cerrado; leg. E. P. Heringer 7342, 12-XI-1959 (typus UB).

Rhodophiala cipoana has its closest affinities in the *Rh. bifida* complex. The latter species has, however, larger globose bulbs deeply immersed in the ground. It resembles somewhat *Rh. araucana* (Phil.) Traub, mainly because of the plant size, but this has smaller erect flowers of a different color.

I found it at km 122 and 123 of the road which passes by the Serra do Cipó. Bulbs were gathered in two different occasions in their vegetative state but did not survive cultivation in Buenos Aires.

In its native habitat plants are submitted to intentional periodical fires, especially during the end of the dry season. Thus it is very difficult to find them in flower. For the same reason they cannot produce seeds freely. Moreover, if we consider the weak bulb which has a short pseudo-neck, and the very restricted area, we realize that the species is in a serious risk of extinction.

Rhodophiala mendocina (Phil.) Rav. comb. nov.

Habranthus mendocinus Philippi, An. Un. Chile 2: 406. 1862.—Excl. syn. *Habranthus mendocensis* (Bak.) Sealy.

Plant about 22-30 cm. high. Bulb subglobose or sometimes ovoid, often very large, about 5-7 cm. in width, produced into a pseudo-neck; outer coats membranous, a dark brown. Leaves few, sometimes serotine, linear, canaliculate, often prostrate, a pale green, pruinose, obtuse, about 20-30 cm. long, 6-10 mm. broad. Scape cylindrical, pruinose, about 16-28 mm. long, 6-10 mm. wide near the base. Spathe bivalved, often 3-5-flowered; valves membranous, free to the base, lanceolate, subequal, about 45-55 mm. long; inner bracts few, almost filiform. Pedicels about 12-20 mm. long. Flowers erect, infundibulate, yellow, about 36-40 mm. long, 30-40 mm. in diameter. Tepals oblanceolate connated for 2.5-3 mm., the outer sometimes tinged with a brownish-red in the outside, apiculate, about 35-40 mm. long, 11-13 mm. broad, the inner about 34-38 mm. long, 10-12 mm. broad. Filaments yellow, ascending, lateral episepal to 9.5-10 mm. long, upper episepal to 10.5-12 mm. long, lower epipetal about 17-18 mm. long, lateral epipetal to 18-18.5 mm. long. Anthers semilunate, yellow, about 3.8-4.5 mm. long. Style arquate, ascending, about 29 mm. long. Stigma trifid, its lobes recurved to 2-2.5 mm. long.

Hab.—In sandy places of the province of Mendoza, Argentina, to the south of the province of La Pampa and Patagonia.

Specimens: Argentina, prov. of Mendoza, Ramblones; leg. Carette 121, I-1921 (SI). Idem, Piedra de Afilar; leg. ipse 160, I-1921 (SI). Idem, dept. of San Carlos; leg. L. M. Torres 8 (SI). Idem, parte austral; leg. R. Guevara, 27-XI-1902 (BAB). Idem dept. of Las Heras, Quebrada

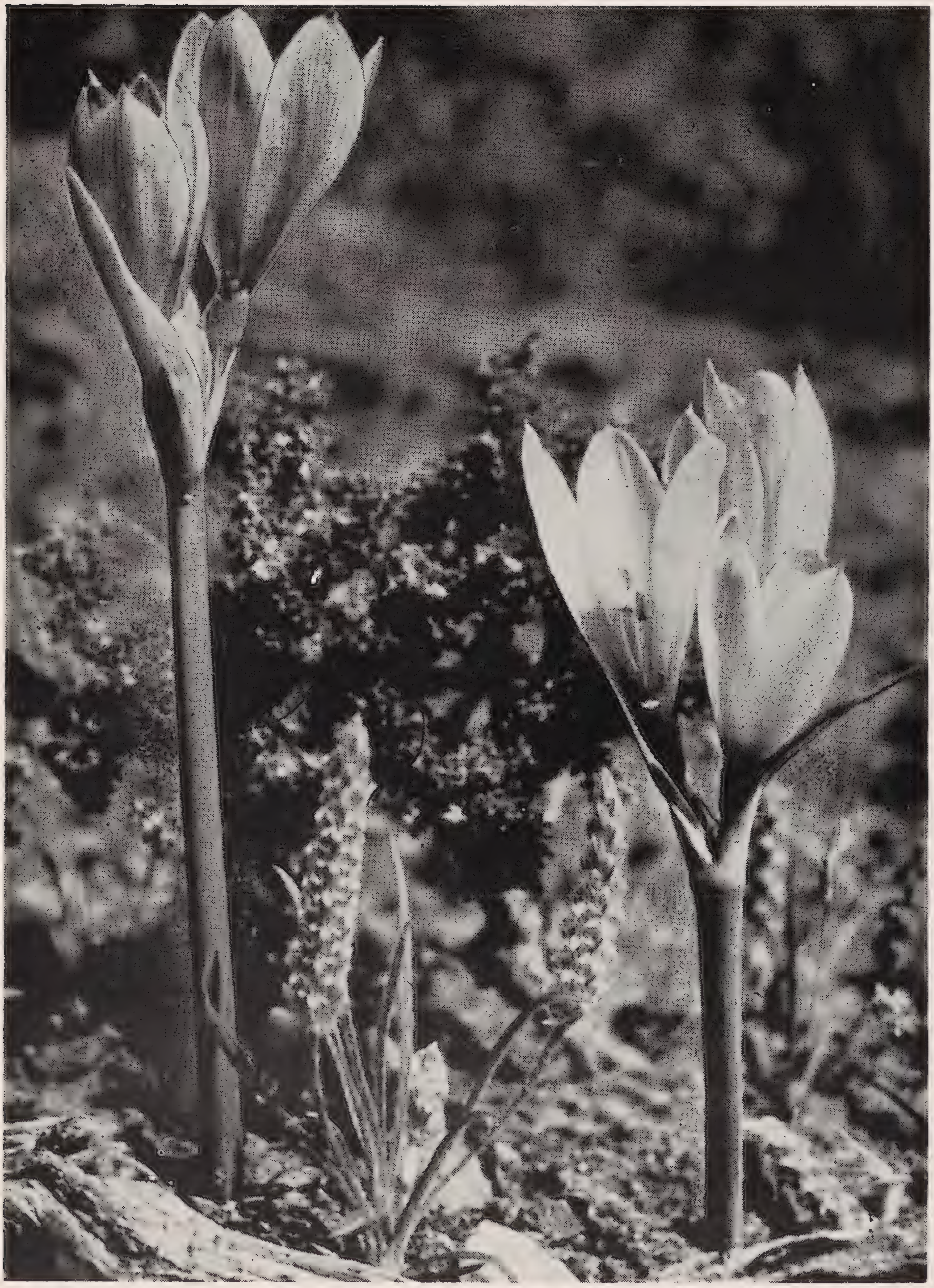

Fig. 22. *Rhodophiala mendocina* (Phil.) Rav., as it grows in northern Neuquen, Argentina. Photo from the archives of the Servicio Nac. de Parques Nacionales.

del Toro; leg. J. Hunziker 6344, 28-III-1954 (BAB), in fruit. Mendoza and Neuquen; leg. Gerling 149, 1907-08 (SI). Idem ibid.; leg. ipse 244 (SI). Prov. of La Pampa, dept. Utracán, Ruta 21; leg. E. Cano 3271, 21-XI-1965 (BAB). Idem, entre Chacharramendi y La Reforma; leg. Ragonese & Piccinini 8139, 17-XII-1951 (BAB). Idem, La Reforma, sobre el rio Salado; leg. O. Solbrig 190, 17-XII-1951 (SI). Prov. of Neuquen, Dept. Chos Malal, Riscos Bayos; leg. Boelcke et al. 11180, 25-I-1964 (BAA, BAB, SI). Dept. of Zapala, 7 km al sud de Zapala, Ruta 40; leg. R. L. Pérez Moreau 3236, 12-XII-1961 (BAB). Prov. of Río Negro, dept. of Adolfo Alsina, camina entre Viedma y S. Antonio Oeste; leg. Correa et al. 2455, XI-1963 (BAB).

Philippi's name *Habranthus mendocinus* was wrongly included as a synonym of *Hippeastrum advenum* in Index Kewensis. This statement was accepted by Traub & Uphof (1938), Traub & Moldenke (1949), and Traub (1953).

Rhodophiala advena (syn. *Hippeastrum advenum* Herb.) is native in the hills and coastal plains of Central Chile. It does not occur in the Argentine province of Mendoza, separated from Chile by the high mountains of the Andes. Our plant was cited in the past by Holmberg (1903, p. 143) under *Hippeastrum pallidum* (Herb.) Pax, a synonym of *Rh. advena.*

The species was collected by Philippi in a place called ''Guadal''. The most similar name which I detected in the province of Mendoza is ''Guadales'', a locality placed near the town of San Rafael. Guadal means sandy place or dune.

Rhodophiala elwesii (C.H.Wr.) Traub, possibly is a mere subspecies of *Rh. mendocina.* A photograph of the latter was published by Böcher et al. (1968), under the name *Hippeastrum bagnoldi* (Herb.) Bak. (= *Rhodophiala bagnoldi*), a Chilean species which is not found in Argentina. Our figure differs from it merely by the absence of leaves; it was photographed in the north of the province of Neuquen.

Rhodophiala bifida (Herb.) Traub ssp. **granatiflora** (Holmb.) **comb. nov.**

Hippeastrum granatiflorum Holmberg, An. Mus. Nac. Buenos Aires 9: 79. 1903.—*Habranthus nemoralis* Herbert, Amaryll.: 159. 1837.—*Amaryllis granatiflora* (Holmb.) Traub et Uphof, Herbertia 5: 120. 1938.—*Phycella granatiflora* (Holmb.) Traub, Pl. Life 9: 62. 1953.—Pro. syn.: *Habranthus intermedius* Herbert, Amaryll.: 160. 1837.

This subspecies differs from the type merely in the lower stature and the vermilion flowers. When plants grow at full sun, the flower color turns to a light pomegranate red.

Plants were collected recently in the type-locality (Maldonado, Republic of Uruguay) by Dr. John Christie, an enthusiast lover of plants. These revealed to be identical to those which I gathered near Balcarce in the Buenos Aires province.

Hab.—Brazil (Río Grande do Sul), Uruguay, and Argentina at

Tandil and Balcarce in the province of Buenos Aires. It grows in plains or hills, among rocks at full sun or rarely in woods.

Specimens: Argentina, prov. of Buenos Aires, Dept. Balcarce, sierra La Vigilancia; leg. R. Martinez Crovetto 2540, II-1944. Idem, sierra Del Sombrero; leg. ipse 1709, I-1943 (BAB). Idem, Tandil; leg. Clos 2232, 14/16-II-1926 (BAB).—Misiones, Bonpland; leg. Joergensen 674, XI-1910 (BAB, SI).

Rhodophiala bifida (Herb.) Traub ssp. purpurea Rav. **ssp. nov.**

A subspecies bifida aemantha et granatiflora floribus vinosis differt; statura et forma floribus subspeciem aemantham similis.

It differs from the rest of subspecies on account of the wine-red flowers. Size of the plant and shape of the flower is similar as in subspecies *aemantha.*

Hab.—Fields of the province of Buenos Aires. I have seen it, apparently of a paler color, on the railway side between the stations of Palomar and Rubén Darío, also near Ezeiza. Cultivated in the botanic gardens of Castelar, Buenos Aires (''C. Thays''), and Faculty of Agronomy of Buenos Aires, plants of the latter two places are of a paler color.

Specimens: Cultivated in the Botanic Garden of Castelar; leg. Ravenna 801, March 1967 (typus in Herb. Ravenna, isotypus BAB et caet.). Cultivated in the Botanic Garden of the Faculty of Agronomy of Buenos Aires; leg. Ravenna 807, April 1969 (Herb. Rav., BAA).

Key to the subspecies of *Rhodophiala bifida*

1a. Flowers of a carmine-pink or purple color.
  2a. Plant robust often to 30-45 cm. high. Flowers a somewhat pale carmine color (''china rose''), about 45-60 mm. long, 40-60 mm. in diameter ---------------------------------- a. *Rh. bifida* ssp. *bifida*
  2b. Plant not robust, to 15 cm. high. Flowers a dark carmine to wine-color about 30-38 mm. long, 30-40 mm. diameter b. *Rh. bifida* ssp. *purpurea*
2b. Flowers of a blood-red or vermilion passing to pomegranate-red.
  2a. Plant weak, not more than 15 cm. high. Tepals 7-10 mm. broad. Flower of a dark blood-red .... c. *Rh. bifida* ssp. *aemantha*
  2b. Plant somewhat robust, about 20-30 cm. high. Tepals to 10-14 mm. broad. Flowers a vermilion passing to pomegranate-red d. *Rh. bifida* ssp. *granatiflora*

Notes.—According to references, white forms are found sometimes in Nature. *Rhodophiala spathacea* (Herb.) Traub, apparently is a synonym of the typical *Rh. bifida.* The latter is found, in Buenos Aires, exclusively in the slopes above the Río de la Plata and Paraná river, growing under partial shade. *Rhodophiala bifida* var. *pulchra* (Herb.) Traub, with flowers 3 cm long, seems to me doubtful; possibly it is a variety of subspecies *purpurea.*

Rhodophiala andicola, transferred to subgenus **Rhodophiala** (Fig. 23)

Rhodophiala andicola (Poepp.) Traub, Pl. Life 9: 60. 1953.—*Amaryllis andicola* Poeppig, Fragm, Syn. Pl. Phan.: 5. 1833.—*Habranthus andicola* (Poepp.) Herb. Amaryll.: 168. 1837.—*Hippeastrum andicolum* (Poepp.) Baker, Trimen's Journ. Bot. 16: 82. 1878.—*Zephyranthes andicola* (Poepp.) Baker, Handb. Amaryll.: 36. 1888.—*Hippeastrum purpuratum* Philippi, An. Un. Chile 93: 156. 1896.—*Amaryllis purpurata* (Phil.) Traub et Uphof, Herbertia 5: 131. 1938.—*Rhodophiala purpurata* (Phil.) Traub, Pl. Life 9: 60. 1953.

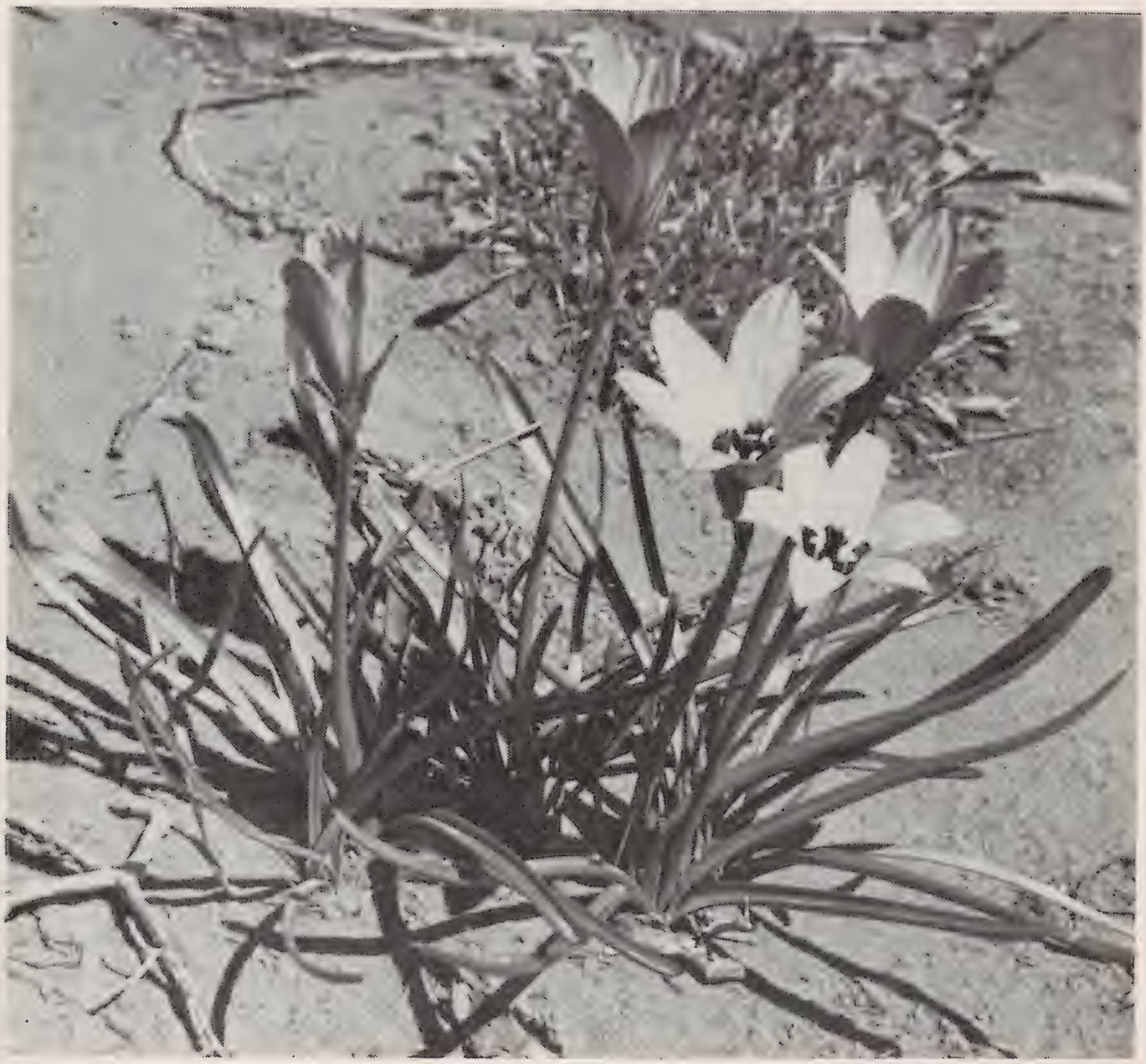

Fig. 23. *Rhodophiala andicola* (Poepp.) Traub, as it grows in the Cerro Chapelco, near San Martín de los Andes, Neuquen, Argentina. Photo from the archives of the Servicio Nac. de Parques Nacionales.

Plant about 17-25 cm. high. Bulb ovoid to 35 mm. long, 20-28 mm. in width, produced into a pseudo-neck for 30-70 mm., covered with brown membranous tunics. Leaves linear, canaliculate, somewhat fleshy, green, obtuse, often spreading on the ground, present at anthesis, about 10-30 cm. long, 2.8-5 mm. broad. Scape cylindrical about 12-26 cm. long. Spathe one-flowered bivalved; valves free down to the base lanceolate subventricose purplish, about 26-50 mm. long, 6-10 mm. wide. Pedicel to 3-7 mm. long. Flowers widely infundibulate erect or slightly inclined about 28-40 mm. long (in expanded flowers) and 35-50 mm. in diameter. Tepals oblanceolate, connated at the base for 6-7 mm., subequal but the outer with a short apiculum, a light carmine-pink paler downwards, passing to a purplish black in the lower third, about 29-39 mm. long, 8-12 mm. broad. Filaments ascending pinkish, the lower episepal pair about 4-5.7 mm. long, upper episepal to 6.7-7 mm. long, lower epipetal about 7.8-8.5 mm. long, the longer epipetal pair to 9-11 mm. long. Anthers oblong curved or semilunate after dehiscences, about 4.5-5.7 mm. long, yellow. Style arquared, ascending about 18-25 mm. long. Stigma capitate-trilobed, a purplish-black, about 1.5-2.5 mm. wide. Capsule globose-tricoccous about 23-25 mm. in width; seeds black, flat with membranous margins rounded to subdeltoid, about 12-14 mm. long, 8-11 mm. broad.

Hab.—In sandy places, especially at the top of the mountains of northern Neuquén in Argentina; also in the Araucanía (Antuco, Linares, Chillán) in Chile.

Specimens: Argentina: Neuquen, Copahue; leg. G. Kraftsik, 11-III-1968 (DPN 10153), in fruit. Idem, S. Martín de los Andes, Cerro Chapelco; leg. M. J. Dimitri, 6-I-1968 (DPN 9750). Idem ibid; leg. S. Schajovskoy, 14-II-1961 (DPN 2868). Idem, Lanín National Park, Quemado de Tromen, Cañadón Grande; leg. S. Schajovskoy, 14-XII-1962 (DPN 5602). Idem, Cerro Chapelco, 1700 m; leg. Irma Gamundí s/n, 13-11-1968 (LP). Idem ibid; leg. Schajovskoy s/n, 24-XII-1968 (LP). Idem, Dept. Mina, Piedra de Gallo; Boelcke et al. 11407, 30-1-1964 (BAA, BAB, SI). Idem, 21 km de Las Ovejas, camino a las lagunas Epu-Lauquen; Boelcke et al. 11045 (BAA, BAB, SI). Idem, Lago Huechulaufquen, subida al Cerro de Los Angeles; leg. Dawson & Schwabe 2631, 7-11-1948 (BAB).

Rhodophiala andicola was tentatively placed in subgenus *Chilanthe* (= subgen. *Rhodophiala*), by Traub & Moldenke (1949). These authors said that "new material of this plant is needed to determine definitely its status". This was done because of the lack of data concerning the stigma. Recently, however, I discovered the species in some Herbaria from here. The identification was possible by comparing the specimens with a photograph of the type (Field Museum series, nr.). The latter was found in the Andes of Antuco in Chile.

Hippeastrum purpuratum Phil. was a later synonym of the species. According to Philippi, this was found in the eastern side of the Andes of Linares. This record should probably be referred to the present territory of Argentina. The citation of the species for Mendoza (as *Zephyranthes andicola*) by Hausman and Vanderveken (1917, p. 284), is probably a misidentification for some other species.

With a clearly capitate-trilobed stigma, *Rh. andicola* is transferred to subgenus *Rhodophiala.*

Rhodophiala laeta revalidated

Rhodophiala laeta Philippi, Fl. Atacam.: 51. 1860.—*Hippeastrum laetum,* (Phil.) Philippi, An. Un. Chile 93: 157. 1896.—*Amaryllis atacamensis* Traub et Uphof, Herbertia 6 (1939) : 151. 1940.

Rhodophiala laeta Phil. was tentatively placed, by Baker (1888), under the synonymy of *Rh. pratensis* (Poepp.) Traub (as *Hippeastrum pratense*). This concept was followed by Traub & Uphof (1938) and Traub & Moldenke (1949).

Although rather related with the latter, *Rh. laeta* shows characters which prove its distinctness as an independent species. In fact, the plant has light pink narrower tepals with a white band in the lower third, stamens and style are shorter, and the inflorescence is, as far as I have seen, always 4-flowered. *Rh. pratensis* has brilliant orange-red flowers with somewhat wider tepals and longer stamens and style; umbels are 1-5-flowered. Moreover, geographical area and ecology of both species are quite different.

I have studied and collected *Rh. laeta* in the hills of Paposo (prov. of Atacama, Chile), which is the type locality. Bulbs were introduced in my collection but unfortunately they did not survive.

Hab.—Hills of Paposo, prov. of Atacama, Chile. It grows in sandy or hard soil at the top of the hills, near *Alstroemeria violacea* Phil., *Croton chilensis* Muell. Arg., *Tigridia* sp. (*Iridaceae*), with yellowish flowers, *Cereus* aff. *iquiquensis,* and others.

Specimens: Chile, prov. of Atacama, top of the hills of Paposo; leg. Ravenna, XII-1961 (Herb. Ravenna).

Rhodophiala maculata (L'Her.) Rav. comb. nov.

Amaryllis maculata L'Heritier, Sert. Angl.: 10. 1788.

L'Heritier's original description says: ''A. spatha uniflora diphylla lineari, flore pedunculato, genitalibus declinatis. Habitat in Chile, Dombey. Scapus punctis lineatis maculatus. Corolla campanulata''.

The clear reference to a bivalved spathe, and a one-flowered inflorescence, suggests a *Rhodophiala* species (possibly in the subgenus *Rhodophiala*). An examination of the type-specimen in the Paris Museum (at present not available on loan), should probably disclose that *Rh. rhodolirion* (Bak.) Traub, is a later synonym of *Rh. maculata.*

III. STUDIES IN THE GENUS **HABRANTHUS**

Among the bulbs collected during my trips to Brazil and the northwestern region of Argentina, were several new species of the genus *Habranthus.* One of the species included here is described from dry material. Moreover, the correct name for the plant formerly known as *Habranthus andersoni* Herb., is revealed.

Habranthus ruber Rav. **sp. nov.** (Fig. 24)

Planta ad 18-47 cm. alta. Bulbus ovatus ad 23-31 mm. longus circ. 17-21 mm. latus tunicis exterioribus brunneis membranaceis et collo usque 25-75 mm. longo instructus. Folia serotina crassiuscula viridia basin versus rufescentia canaliculata (canalis pallidior) cum marginis rotundato-incrassatis (ut in *H. gracilifolius*) longitudinis scaporum circ. 3 mm. lata. Scapus teres ad 20-42 cm. longus circ. 3-3.8 mm. latus pallide viridis basin versus erubescens. Spatha uniflora (raro biflora?) viridirubescens ad 25-37 mm. longa circ. 17-20 mm. bifida. Pedicellus usque 50-57 mm. longus. Flos utrinque ruber concolor vel raro ad basin vera viridis ad 44-56 mm. longus circ. 35-48 mm. latus vel 40 mm. in diametro horizontale et 48 in diametro verticale. Ovarium oblongo-clavatum obtuse angulatum ad 5 mm. longum circ. 2.2-2.3 mm. latum. Tepala oblanceolata ad 3.3-5 mm. concrescentia, exteriori-superius ad 36-52 mm. longum circ. 10.2-11.8 mm. latum tuberoso-apiculatum, apiculo circ. 0.8 mm. longo, exteriori-lateralia ad 37-54 mm. longa circ. 10 mm. lata, interiora ad 35-50.2 mm. longa circ. 8.3-10.2 mm. lata acuta. Filamenta declinata, sepalina lateralia ad 12.5-20 mm., sepalinum superius usque 16.5-25 mm. longum, petalinum inferius ad 18-31.6 mm. longum, petalina lateralia ad 22-35 mm. longa. Antherae semilunatae luteae usque 3-4 mm. longae. Stylus declinatus ex ovario circ. 27-39 mm. longus; stigmae lobi patentes usque 1.6-1.8 mm.

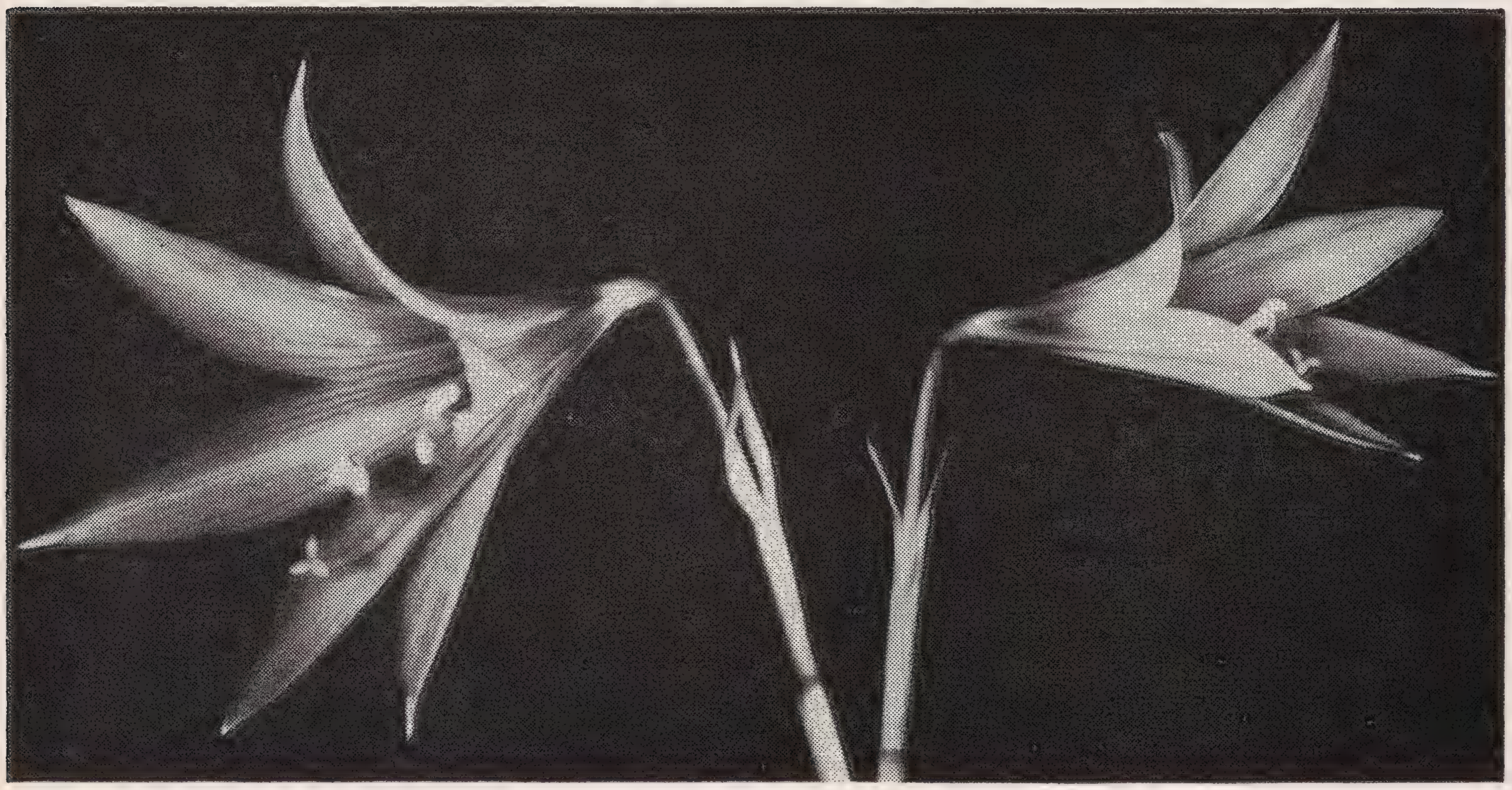

Fig. 24. *Habranthus ruber* Rav. *Left,* wild, and *Right,* as cultivated in Buenos Aires, from bulbs collected near Cruz Altinhae, R. G. do Sul, Brazil. Photo S. Magno.

Plant about 18-47 cm. high. Bulb ovate about 23-31 mm. long, 17-21 mm. in width, produced into a pesudo-neck for 25-75 mm.; the outer tunics of a dark brown, membranous. Leaves serotine, somewhat fleshy,

green, somewhat reddish downwards, canaliculate (the canal paler), with rounded—thickened margins (as in *H. gracilifolius*), as long as the scapes, to 3 mm. broad. Scape cylindrical, to 20-42 cm. long, 3-3.8 mm. wide, a pale, green, reddish downwards. Spathe one-flowered (rarely two-flowered?), a reddish green, to 25-37 mm. long, bifid for 17-20 mm. Pedicel to 50-57 mm. long. Flower uniformly red or rarely green at the very base, to 44-56 mm. long and 35-48 mm. in diameter, or 40 mm. in its horizontal diameter and 48 mm. in its vertical diameter. Ovary clavate-oblong, obtusely angled, to 5 mm. long, 2.2-2.3 mm. in width. Tepals oblanceolate, concrescent for 3.3-5 mm.; the upper outer to 36-52 mm. long, 10.2-11.8 mm. broad, tuberose-apiculate, the apiculum about 0.8 mm. long, the outer lateral to 37-54 mm. long, 10 mm. broad, inner about 35-50.2 mm. long, 8.3-10.2 mm. broad, acute. Filaments declined, the lateral episepal to 12.5-20 mm. long, upper episepal about 16.5-25 mm. long, lower epipetal to 18-31.6 mm. long, lateral epipetal about 22-35 mm. long. Anthers semilunate, yellow to 3-4 mm. long. Style declined about 27-39 mm. long; lobes of the stigma spreading, to 1.6-1.8 mm. long.

Hab.—In grassy fields at woods' margins near Cruz Altinha, also near Caracol, State of Río Grande do Sul, Brazil.

Specimens: Circ. 1 km ad orientem Cruz-Altinhae (mun. Passo Fundo) civit. Río Grande do Sul Brasiliae; leg. Ravenna 1001, II-1968 (typus in Herbario Ravenna). Río Grande do Sul, mun. Jaguarí, Caracol, Salto de Caracol; leg. K. Emrich, febr. 1953 (PACA 52819). Idem, Caracol; leg. ipse, 24-II-1948, spathe 2-flowered (PACA 37193). Idem ibidem; leg. ipse, II-1951 (PACA 50219).

This pretty species I have found about 1 km east of Cruz Altinha between Passo Fundo and Lagoa Vermelha, in the State of Río Grande do Sul, Brazil. It was growing at the margins of small woods near the road.

Habranthus ruber is closely related to *H. gracilifolius* Herb. to which it resembles by the quite similar but broader leaves. *Habranthus cardinalis* C.H.Wr., from Jamaica, has orange-red flowers, but tepals are blunter and the leaves flat.

Our plant has the most pure red (vermilion) flowers, an unusual color in the genus. The flower of the type-specimen, collected in the field, is somewhat smaller than usual, possibly because it was found at the end of the flowering time.

Habranthus niveus Rav. sp. nov.

Planta circ. 25-30 cm. alta. Bulbus ovatus ad 5 cm. longus circ. 3-3.3 cm. latus in collo productus, tunicis exterioribus fuscis. Folia basalia ad anthesin nulla serotina post anthesin 2-4 usque 16 cm. longa circ. 7.5-10 mm. lata cinereo-viridia pruinosa leviter canaliculata ad apicem obtuse. Scapus teres circ. 15-17 cm. longus. Spatha univalvata uni-flora usque 48 mm. longa circ. 25 mm. tubulosa ad apicem fenestrata vel paullo longior) albus senectutem versus erubescens usque 55 mm. longus circ. 45-50 mm. latus. Ovarium oblongum ad 8.6 mm. longum circ. 3.4

mm. latum. Tepala oblanceolata ad basin breviter concrescentia, exteriora ad 52-54 mm. longa circ. 15 mm. lata ad apicem crassiuscule apiculata, interiora ad 51-53 mm. longa circ. 18-19 mm. lata. Stamina fasciculato-declinata, dua breviora ad 15 mm. longa, dua longiora circ. 31 mm. longa, intermedia usque 20 et 23 mm. longa. Antherae arquate semilunatae usque 8 mm. longae; pollen loculique lutei. Stylus declinatus ex ovario circ. 35-37 mm. longus; stigma trifidus, lobis recurvatis usque 4-4.5 mm. longi.

Plant to 25-30 cm. high. Bulb ovate to 5 cm. long and 3-3.3 cm. wide, produced into a pseudoneck, covered with dark coats. Leaves none at anthesis, serotine, 2-4, to 16 cm. long, 7.5-10 mm. broad, a grayish green, pruinose, slightly canaliculate, obtuse. Scape cylindrical to 15-17 cm. long. Spathe one-flowered to 48 mm. long, tubulose for 25 mm., the apex fenestrate or bifid. Flower cernuus, pedicellate (pedicel equaling the spathe or somewhat longer), white, pink-tinged with age, to 55 mm. long, 45-50 mm. in diameter. Ovary oblong, to 8.6 mm. long, 3.4 mm. wide. Tepals oblanceolate, shortly connated at the base, the outer about 52-54 mm. long, 15 mm. broad, the apex with a somewhat thick apiculum, inner ones about 51-53 mm. long, 18-19 mm. broad. Stamens fascicled, declined, the shorter pair 15 mm. long, longer pair about 31 mm. long, intermediates about 20 and 30 mm. long. Anthers semilunate to 8 mm. long; pollen yellow. Style declined to 35-37 mm. long; stigmatrifid, its lobes recurved, to 4-4.5 mm. long.

Hab.—Argentina, sandy plateau between Chilecito (prov. of La Rioja) and Andalgalá (prov. of Catamarca). I have collected it at La Aguada, near Andalgalá; it grows near *Habranthus andalgalensis* Rav. and *Opuntia* sp.

Specimens: Argentina: Catamarca, Andalgalá, La Aguada; leg. Ravenna 113, XII-1961 (typus in Herbario Ravenna). Idem, abundante en el campo seco; leg. P. Joergensen 1214, 6-XII-1915 (BA, SI). Idem, El Candado; leg. Joergensen 1214 bis, II-1915 (BA).

This species is separable from *H. jujuyensis* (Holmb.) Traub, on account of its leaves, which are more or less flaccid and not so pruinose. In the latter species the tepals are greenish inside near the base, with grayish lines in the outside; filaments are greenish.

Habranthus niveus grows along the sandy xerophytic uplands of the provinces of La Rioja and Catamarca. It is very floriferous; the very large flowers make a pretty effect among bushes and cacti. The natives call it ''sacha cebolla'' or ''cebolla de zorro''.

Habranthus riojanus Rav. **sp. nov.**

Planta circ. 17-18 cm. alta. Bulbus ovatus ad 3-3.5 cm. longus circ. 2.5-2.7 cm. latus in collo circ. 3-5 cm. vel ultra longus productus, tunicis brunneis vestitus. Folia basalia ad anthesin saepissime nulla, post anthesin circ. tres ad 15 cm. longa circ. 4 mm. lata viridia haud pruinosa. Scapus gracilis ad 13-14 cm. longus circ. 3 mm. latus saepe ochraceo-roseus. Spatha uniflora valva unica ad 3.5 cm. longa circ. 12 mm. tubulosa superne fenestrata. Flos roseus infundibulatus ad 4 cm. longus circ. 3 cm. latus. Pedicellus usque 13 mm. longus. Ovarium obovatum obtuse triquetrus viride ad 55 mm. longum circ. 3.5 mm. latum. Tepala oblanceolate ad basin circ. 4-4.5 mm. concrescentia, exteriora usque 35 mm. longa circ. 11.8 mm. lata, interiora subaequalia circ. 11.3 mm. lata. Stamina fasciculato-declinata, longiora circ. 16.5 mm. longa, breviora circ. 7 mm. longa, sepalinum superius ad 8 mm. longum, petalinum inferius circ. 9 mm. longum. Stylus declinatus ex ovario circ. 23 mm. longus; stigmae lobi paullo recurvati ad 2.8-3 mm. longi.

Plant to 17-18 cm. high. Bulb ovoid about 3-3.5 cm. long, 2.5-2.7 cm. wide, produced into a pseudo-neck for 3.5 cm., covered with dark brown coats. Leaves almost always none at anthesis, about three, to 15 cm. long, 4 mm. broad, green, not pruinose. Scape weak to 13-14 cm. long, 3 mm. wide, often of a brownish-pink. Spathe one-flowered about 3.5 cm. long, tubulose for 12 mm., then fenestrated. Flower pink, funnel-shaped about 4 cm. long, 3 cm. in diameter. Pedicel to 13 mm. long. Ovary obovate, obtusely trigonous, green, about 5 mm. long, 3.5 mm. wide. Tepals oblanceolate, concrescent for 4-4.5 mm., the outer to 35 mm. long, 11.8 mm. broad, inner subequal, about 11.3 mm. broad. Stamens fascicled, declined, the longer pair to 16.5 mm. long, shorter pair about 7 mm. long, upper episepal about 8 mm. long, lower epipetal to 9 mm. long. Style declined about 23 mm. long; lobes of the stigma somewhat recurved, about 2.8-3 mm. long.

Hab.—Grassy slopes, at 2900-3100 m. over the sea level, in the province of La Rioja, Argentina; I collected it near Mina del Oro, above Chilecito. It grows near *Eustephia marginata* Pax.

Specimens: Argentina, prov. La Rioja, Mina del Oro, above Chilecito, about 2900 m.; leg. Ravenna 107 (type in Herb. Ravenna). Idem, Sierra de Famatina, Rio de las Cuevas; leg. A. Krapovickas & J. Hunziker 5565, 25-I-1949 (BAB, SI). Idem, dep. Lamadrid, entre Las Palomas y Las Lampsvas; leg. ipses 5553, 24-I-1949 (BAB).

This species is closely related to *H. mendocensis* (Bak.) Sealy;[1] whereas, its leaves are of a dark green, not pruinose, and somewhat narrower from the latter. Moreover, its tepals do not have incurved margins and they are less obtuse. It grows near *Eustephia marginata* Pax.

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[1] **Habranthus mendocensis** (Bak.) Sealy, Journ. Roy Hort. Soc. 62: 208. 1937; **Zephyranthes mendocensis** Baker, Handb. Amaryll.: 36. 1888; **Habranthus reedii** Traub, Pl. Life 7: 42. 1951.

Habranthus mendocinus Phil. (=**Rhodophiala mendocina**) and **H. mendocensis** (Bak.) Sealy, bear different specific epithets; therefore the later name **H. reedii** Traub, appears to be superfluous.

Habranthus irwinianus Rav. **sp. nov.**

Planta ad 13-14 cm. alta. Bulbus subglobosus ad 16-18 mm. longus circ. 13-16 mm. latus in collo saepe brevi productus, tunicis exterioribus fusco ochraceis. Folia basalia ad anthesin incipientia pauca vel subnulla lineari-filiformia circ. 0.6 mm. lata. Scapus ad 9-10 cm. longus circ. 1.3 mm. latus (?). Spatha uniflora circ. 17-18 mm. longa ad 12-13 mm. tubulosa circ. 6-7 mm. bifida. Pedicellus ad 13-26 mm. longus. Flos

usque 12 mm. longus circ. 20 mm. latus colore incertus. Ovarium obovatum parum obtuso-triquetrum ad 2.8 mm. longum circ. 1.5-1.8 mm. latum. Tepala oblanceolata ad 1.5 mm. connata, exteriora ad 33.5 mm. longa circ. 4.8 mm. lata apiculata, interiora paullo breviora. Filamenta declinata, sepalinum superius ad 5 mm. longum, sepalina lateralia inaequalia usque 9 et 14 mm. longa, petalina lateralia ad 14.5 mm. longa, petalinum inferius circ. 15.5 mm. longum. Stylus declinatus ex ovario circ. 22 mm. longus; stigmae lobi recurvati circ. 2-3.5 mm. longi.

Plant to 13-14 cm. high. Bulb almost globose about 16-18 mm. long, 13-16 mm. in width, produced into a pseudo-neck; the outer tunics of a dark brown. Leaves incipient at anthesin, few, or practically absent, linear-filiform, about 0.6 mm. broad. Scape about 9-10 cm. long, 1.3 mm. wide (?). Spathe one-flowered about 17-18 mm. long, tubulose for 12-13 mm., then bifid for 6-7 mm. Pedicel about 13-26 mm. long. Flower to 12 mm. long, 20 mm. in diameter, its color unknown. Ovary clavate, apparently obtusely trigonous, about 2.8 mm. long, 1.5-1.8 mm. wide. Tepals oblanceolate, connated for 1.5 mm., the outer to 33.5 mm. long, 4.8 mm. broad, apiculate, inner somewhat shorter. Filaments declined, the upper episepal to 5 mm. long, lateral episepal unequal, about 9 and 14 mm. long, lateral epipetal to 14.5 mm. long, lower epipetal about 15.5 mm. long. Style declined about 22 mm. long; stigma's lobes recurved to 2-3.5 mm. long.

Hab.—Mountains of south-western Minas Gerais, Brazil, at Casa de Pedra (near Congonhas do Campo) Serra da Piedade, and other places.

Specimens: Brazil, Minas Gerais, mun. Caeté, Serra da Piedade, campo; leg. Mello Barreto 8809, 19-II-1938 (type Herb. Ravenna, isotype BHMG, NY, TRA). Idem ibid.; leg. ipse 5174 (BHMG). Idem ibid, Campo Itabirito; leg. ipse 618, 28-XII-1933 (BHMG) et 619, 6-V-1934 (BHMG). Idem mun. Conselhero Lafayette, Casa de Pedra pr. Congonhas; leg. ipse 5504 (BHMG).

Habranthus irwinianus is related to *H. gracilifolius* Herb. The latter—an inhabitant of Río Grande do Sul, Uruguay and Argentina—has leaves with rounded thick margins and its flowers are larger.

The specific name was given in homage to Dr. Howard S. Irwin, of The New York Botanical Garden, whose important work of collecting in Central Brazil, will help a lot to the knowledge of the neotropical flora.

Habranthus concordiae Rav. **sp. nov.**

Planta ad 40-45 cm. alta. Bulbus ovatus in collo plus minusve longo productus. Folia serotina late linearia pallide viridia valde pruinosa leviter canaliculata ad 20 cm. longa circ. 6 mm. lata. Scapus usque 27-35 cm. longus circ. 4-5 mm. latus pallide viridis pruinosus basin versus roseo-ochraceus. Spatha 2-3-flora raro uniflora ad 24-33 mm. longa circ. 10-13 mm. tubulosa ad apicem usque 7-11 mm. bifida. Flores anguste infundibulati pulchre rosei ad 5-6.5 cm. longi circ. 3.5-4 cm. lati. Pedicelli ad 67-80 mm. longi. Ovarium subclavatum ad 5.8-6 mm. longum circ. 2.6-2.9 mm. latum. Tepala oblanceolata perangusta ad 2.5 mm. connata striis fusco-roseis notata, exteriora ad 50-57 mm. longa circ. 10 mm. lata, interiora subaequalia. Filamenta declinata rosea ad apicem

leviter incurva, sepalina lateralia ad 20 mm. longa, sepalinum superius ad 21 mm. longum, petalinum inferius circ. 25 mm. longum, petalina lateralia usque 28 mm. longa (in floris minoris filamenta breviora). Antherae oblongae leviter arquatae ad 3.5-4.1 mm. longae. Stigma trifidus, lobis recurvatis usque 1.4-1.8 mm. longis.

Plant about 40-45 cm. high. Bulb ovoid produced into a pseudoneck. Leaves serotine, broadly linear, of a pale green, rather pruinose, slightly canaliculate, to 20 cm. long and 6 mm. broad. Scape to 27-35 cm. long, 4-5 mm. wide, of a pale green, pruinose, a brownish pink toward the base. Spathe 2-3-flowered, rarely one-flowered, to 24-33 mm. long, tubulose for 10-13 mm., then bifid for 7-11 mm. Flowers narrowly funnel-shaped, pink, about 5-6.5 cm. long, 3.5-4 cm. in diameter. Pedicels about 67-80 mm. long. Ovary almost clavate, to 5.8-6 mm. long, 2.6-2.9 mm. wide. Tepals oblanceolate, very narrow, connated for 2.5 mm., marked with dark pink lines, the outer to 50-57 mm. long, 10 mm. broad, the inner subequal. Filaments declined pink, somewhat incurved at the apex, the lateral episepal about 20 mm. long, upper episepal to 21 mm. long, lower epipetal about 25 mm. long, lateral epipetal to 28 mm. long (in small flowers filaments are shorter). Anthers oblong, somewhat curved, to 3.5-4.1 mm. long. Stigma trifid, its lobes recurved to 1.4-1.8 mm. long.

Hab.—Fields in the region of Concordia, province of Entre Ríos, Argentina.

Specimens: Argentina, prov. Entre Ríos, region of Concordia; cult. in SI; leg. Burkart 21687, 24-III-1961 (type SI).

This pretty species was found by Prof. A. Burkart near the town of Concordia in the province of Entre Ríos. Each spathe bears one to three narrow light pink flowers. The only species from that region which has more than one flower is *H. teretifolius* (C.H.Wr.) Traub (sensu Hunziker 1969); however, this has cylindrical fistulose leaves. *Habranthus gracilifolius* Herb. has rarely a two-flowered umbel, but its leaves are practically filiform. *Habranthus pedunculosus* Herb. (a true *Habranthus* species) has a much longer spathe of a different shape. *H. longipes* (Bak.) Traub, from the Republic of Uruguay, has a fenestrated one flowered spathe.

Habranthus tubispathus (L'Her.) Traub (Fig. 25)

a previous name for the plant known as **H. andersonii**

Since I was entrusted to carry out the monography of the *Amaryllidaceae* of Patagonia and the Province of Entre Ríos I was occupied with the problem concerning the application of the names *Zephyranthes commersoniana* Herb. and *Habranthus tubispathus* (L'Her.) Traub. The former was based on specimens collected by Commerson in the Cerro de Montevideo, during Bougainville expedition around the world.

A time ago I asked for photographs of three sheets of Commerson's collection of *Zephyranthes commersoniana* Herb. Two photographs were received from the Paris Museum through the kindness of Dr. Alicia Lourteig, the third, by courtesy of Kew Gardens, from a collection of negatives taken from Commerson's collection, deposited in the Linnean Society of London. On the label of one of the Paris specimens is written: "Uruguay, Montevideo, dans les pâturages de Montevideo ceux surtout qui sont au pied du Morro, en May 1767". At foot of the second sheet, we can read: "Uruguay, Montevideo, du pied du Morro de Montevideo et par les pâturages des environs de la Baye en 9bre. 1767; flos rubicundus in scapo unicus. Bulbus tunicatus. Plantes retardées des rochers de Montevideo mi-9bre. 1767". On the third specimen which is the holotype (deposited in the Linnean Society of London), it is only written: "Montevideo, Commerson". The three sheets represent a sole species: a plant with small flowers and linear, somewhat broad, leaves.

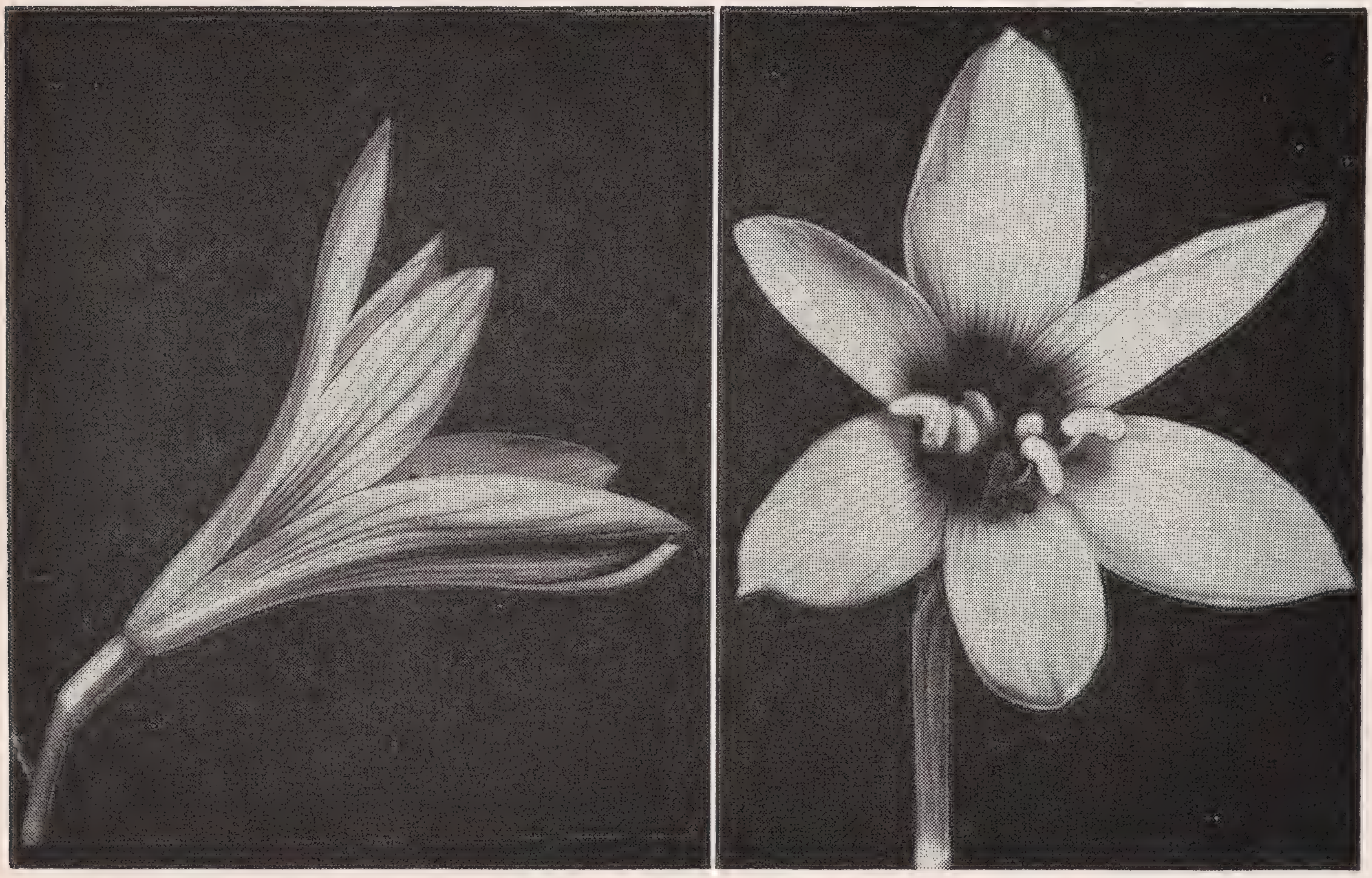

Fig. 25. *Habranthus tubispathus* (L'Her.) Traub, ssp. *macranthus* Rav., from the province of Entre Ríos in Argentina; *Left,* side view; and *Right,* front view. Photo S. Magno.

In 1966 I was in the Cerro de Montevideo and found that there grow only two *Habranthus* species: *H. gracilifolius* Herb. and *H. andersonii* Herb. the first has almost filiform leaves, and the latter linear, to 3-5 mm. broad, leaves. Notwithstanding, *H. andersonii* has sulphur-yellow flowers, tinged with purple in the throat and the outside. How could this plant have had its flowers misinterpreted as pink? Following the process of drying on several flowers, the answer arises. In some of them it prevails the purple color (anthocyanine) of the throat and the outside of the perianth and they turn to a light pink. After a time, the latter color practically disappears and a brownish yellow remains.

Amaryllis tubispatha L'Her., was founded on specimens collected also by Commerson in Buenos Aires. A photograph of the type-specimen (received from the Paris Museum) shows two floriferous scapes, apparently of two different species. Differences are found in the size and shape of the flowers. At foot there is a label from Dr. Traub which says: ''The scape in flower on the right hand is designated as the lecto-type of *Amaryllis tubispatha* L'Her.'' Obviously he noted that there was a mixture on the sheet and he decided to select one of the inflorescenses as the lecto-type of *Amaryllis tubispatha* L'Her. (= *Habranthus tubispathus*).

If we examine accurately the element on the left of the type-sheet, we should realize that it apparently represent . . . *Zephyranthes candida* (Lindl.) Herb. The lecto-type, on the right side, can readily be identified as *Habranthus andersonii* Herb. The shape and size of the flower are evidences which support the latter conclusion. Both *Z. candida* and *H. andersonii* (= *H. tubispathus*), are still quite frequent in the neighbourhoods of the city of Buenos Aires. *H. gracilifolius* Herb. with pink flowers grows in the hilly region of the south of the province, and in the province of Entre Ríos. The latter species does not inhabit the area of the Capital of Argentina.

Amaryllis tubispatha is quoted, in Index Kewensis, as a synonym of *Habranthus robustus* Herb. ex Sweet. Traub (1951) accepted that concept, but, due to priority, he proposed the new combination *H. tubispathus* (L'Her.) Traub. As I have pointed out (see Ravenna 1967), *H. robustus* has no affinities with *H. tubispathus;* it is a much more robust plant and it is an inhabitant of the State of Santa Catarina in Brazil. Recently it had been dried also from the State of Paraná by Prof. G. Hatschbach. In spite of this fact, *H. robustus* was included by Fabris (1969) in the ''Flora de la Provincia de Buenos Aires''. This author followed Cabrera (1953), who recorded the species to this area, basing his statement on a dry specimen (Boelcke 5121) which was apparently lost. It is possible that Cabrera's record of *H. robustus* should be referred in the future to another species. In fact, Fabris describes it as ''flores solitarias o geminadas''; inflorescences in *H. robustus* are always one-flowered.

Amaryllis atamasco Linn. var. *minor* Red., which Herbert included under synonymy of *H. robustus,* is a true *Zephyranthes* species, possibly not a native of South America.

The complete synonymy of *H. tubispathus* follows below: *Habranthus tubispathus* (L'Her.) Traub, Pl. Life 7: 42. 1951. Syn.—*Amaryllis tubispatha* L'Heritier, Sert. Angl.: 9. 1769; *Habranthus andersonii* Herbert, Edwards' Bot. Reg. 16. tab. 1345. 1830.—*Habranthus andersonianus* Herbert, Amaryll.: 167. 1837; *Zephyranthus commersoniana* Herbert, loc. cit.: 174, tab. 29, f.3. 1837; *Zephyranthes andersonii* (Herb.) Steudel, Nom. Bot. ed. II, 1: 70. 1840; *Amaryllis andersonii* (Herb.) Grisebach, Goett. Abhandl. 24: 320. 1879; *Zephyranthes andersoniana* (Herb.) Bentham et Hooker f., Gen. Pl. 3(2): 724. 1883, Excl. syn.: *Habranthus robustus* Herb. ex Sweet (1831), and *Zephyranthes* *atamasco* Linn, var. *minor* Red. (1816).

Hab.—Plains and hills of Southern Brazil, Uruguay, Eastern Argentina and Central and Southern Chile. It is also found in Texas (United States).

Specimens: *Argentina:* Buenos Aires; leg. Commerson; Herb. Poiret in Herb. Moquin Tandor (photo from the type of *Amaryllis tubispatha* L'Her., in part, P). *Uruguay:* Montevideo; leg. Commerson, V-1767 (photo P). Idem; leg. Commerson, XI-1767 (photo P). Idem ibid; leg. Commerson (photo of the type of *Zephyranthes commersoniana* Herb., Linn. Soc. London).

Habranthus tubispathus also inhabits Chile. It was quoted in this country by Gay (1853), and Baker (1888). Years ago, I received seeds collected in Chile by Dr. R. Wygnanki; when the plants flowered here in Buenos Aires, they were identified as this species. Flowers had somewhat acuter segments than the ordinary ones, but they were in other respects similar to the forms which grow naturally here. The Chilean *Amaryllis depauperata* Poepp. probably is a further synonym of this species.

Habranthus tubispathus (L'Her.) Traub ssp. **macranthus** ssp. nov.

A subspecie tubispatha floribus majoribus (ad 30-35 mm. longi et 30-35 mm. in diametro) differt; colore ut in typo.

Differs from the subspecies *tubispathus,* on account of its larger flowers (to 30-35 mm. long and 30-35 mm. in diameter); the color as in the type.

Hab.—Fields of the province of Entre Ríos, Argentina.

Specimens: Argentina, prov. Entre Ríos, Concepción del Uruguay, Estación Experimental Agropecuaria, potrero 64; cult. in Buenos Aires; leg. Ravenna 807, XII-1967 (typus in Herb. Ravenna). Concepción del Uruguay, aerodromo; leg. Burkart et al. 20593, 16-XII-1957 (SI). Dept. Gualeguaychú, ruta 12, km. 180; leg. Burkart et S. Crespo 22944, 22-XII-1961 (SI). Idem, arroyo Gualeyán; leg. Burkart et Troncoso 24139, 8-IV-1963 (SI).

Habranthus tubispathus (L'Her.) Traub ssp. **variabilis** ssp. nov.

Recedit a subspecis tubispatho et macrantho floribus colore variabile extus haud purpureo-striatis basin versus valde attenuatis.

Separable from the subspecies *tubispathus* and *macranthus,* by virtue of its flowers of variable color, externally not purple-striated, and narrower toward the base.

Hab.—Dry fields in the east side of the province of Corrientes, Argentina. It grows near *Habranthus teretifolius* (in the sense of Hunziker, 1967).

a. *H. tubispathus* ssp. *variabilis* Rav. var. *variabilis*

Flos aurantiacus. Flower orange. Specimens: Ad viam ferream inter Paso de los Libres et Monte Caseros prov. Corrientes Argentinae; leg. Ravenna 446, III-1965 (typus in Herbario Ravenna).

b. *H. tubispathus* ssp. *variabilis* Rav. var. *bicolor* Rav. var. nov.

Recedit tepalis albis ad apicem fulvo-tinctis. Distinguishable by its white tepals stained with fulvous at the apex. Specimens: Eadem locis; leg. Ravenna 447, III-1965 (typus in Herbario Ravenna).

c. *H. tubispathus* ssp. *variabilis* Rav. var. *roseus* var. nov.

Flos roseus. Flower pink. Specimens: Eidem locis; leg. Ravenna 448, III-1965 (typus in Herbario Ravenna).

Habranthus pedunculosus Herb.

Herbert, Amaryll.: 161, Pl. 26, f.3. 1837.

Despite its distinctness in the genus *Habranthus,* this species was tentatively included by Baker (1888), under synonymy of *Hippeastrum bifidum* (*Rhodophiala bifida*). This concept was accepted in Index Kewensis, by Traub & Uphof (1938), Traub & Moldenke (1949), and Traub (1956). Notwithstanding, Herbert's description is clear: . . . ''absque foliis. Scapo unciali bifloro; spatha tubulosa apice bifido''. . . . Moreover, there is a figure, from the hand of Herbert, made after the type-specimen. The latter dry material shows clearly the tubular spathe, which is an important feature in order to separate *Habranthus* from *Rhodophiala.*

An accurate examination of the type should possibly reveal that the plant known as *H. teretifolium* (C.H.Wr.) Traub, is identical to this species. Whereas, it must be noted that the original description of the latter is very poor and inconclusive. Moreover, I was informed from Kew Gardens, that no type-specimen exists. Despite this fact, *H. teretifolius* was quoted in the flora of Argentina by Hunziker (1967). Description and figure of the work represent the same plant which Traub & Hayward named *H. juncifolius.* The latter species was overlooked by Hunziker (1967). Wright's description says ''flowers of a pale pink'', which is not the case of *H. juncifolius.*

Hippeastrum tubispathum Pax, is apparently the same as *Habranthus juncifolius* Traub & Hayward. Unfortunately, the former name cannot be used because of *H. tubispathus* (L'Her.) Traub. If it can truly be proved that *H. teretifolius* (C.H.Wr.) is the same species as *H. juncifolius* (Traub & Hayw.), then the latter must be kept under synonymy. Furthermore, studies on living plants of *Habranthus holmbergii* (Hicken) Traub (from the type-locality), are needed.

Specimens: Buenos Aires; leg. Tweedie (Herbarium Hookerianum, photo-type from K, neg. 9859).

PLANT LIFE LIBRARY—continued from page 69.

THE PLASMODIOPHORALES, 2nd ed., by John S. Karling. Hafner Publishing Co., 31 E. 10th St., New York, N.Y. 10003. 1968. Pp. 256. Illus. $17.50. Marked progress has been made in the understanding of the Plasmodiophorales in the past twenty years. The new information is incorporated in this completely revised new edition of a standard work. About half of the space is devoted to the fungi which comprise the Plasmodiophorales—cytology, sexuality, life cycles, etc., description of family, genera and species, phylogeny and relationships. The rest of the space is devoted to the economically important diseases which these fungi cause—club root of crucifers and its control; powdery scab of potatoes; crook rot of watercress; and rhizomania of the sugar beet. Highly recommended to phytopathologists, botanists and biologists in general.

ORGANOGRAPHY OF PLANTS, by K. Goebel, translated by I. B. Balfour. Facsimile of the 1900 English Edition. Part 1. General Organography. 1969. Pp. 270. Illus. $32.50; Part 2. Special Organography. 1969. Pp. 707. Illus. $32.50. Hafner Publishing Co., 31 E. 10th St., New York, N. Y. 10003. We are grateful to the publishers for reprinting this classic work of Goebel on organography which has been unavailable for two decades. Thus, it is now again available to the students in the 1970's. Volume 1 is devoted to general considerations, and volume 2 to special organography. Very highly recommended to all interested in plant science.

A FLORA OF NORTH AMERICA, by John Torrey and Asa Gray. Facsimile of the 1838-43 Edition. Hafner Publishing Co., 31 E. 10th St., New York, N. Y. 10003. Vol. 1. Pp. 711. $45.00. 1969; Vol. 2. Pp. 505. $45.00. 1969. Although not completed, this is a basic reference work for those interested in the systematics of the indigenous and naturalized plants growing north of Mexico. It contains abridged descriptions of the plants included up to 1843. The groups are arranged according to the natural system. Dr Joseph Ewan has added an illuminating introduction detailing the history of the collaboration between Torrey and Gray. Very highly recommended to all interested in the flora of North America.

VASCULAR PLANTS OF THE PACIFIC NORTHWEST, PART 1, VASCULAR CRYPTOGAMS, GYMNOSPERMS, AND MONOCOTYLEDONS, by C. Leo Hitchcock, Arthur Cronquist, and Marion Ownbey. University of Washington Press, Seattle 98105. 1969. Pp. 914. Illus. $25.00. Parts 2 through 5 of this outstanding series appeared previously, and have elicited high acclaim as definitive guides to the Dicotyledons of the Pacific Northwest. The first volume, including the Cryptogams, Gymnosperms and Monocotyledons of the Pacific Northwest, has now been published, and it measures up to the high standard set in the previously published volumes. The area covered includes Washington, Northern Oregon, Idaho north of the Snake River, the mountains of western Montana, and southern British Columbia.

The genera **Allium** and **Calochortus** in the **Liliaceae** have been contributed by Ownbey; the vascular cryptogams and **Cyperaceae** by Cronquist, and all the other groups by Hitchcock. Complete regional synonymy, type collections, geographic ranges, common names, and chromosome numbers where determined, and economic importance are given. Part 1 also includes several sections relating to the work as a whole: an index to plant families, a glossary, a key to aquatic plants; and a general index to common, generic and specific names. This basic contribution to the vascular plants of the Pacific Northwest is very highly recommended to the professional plant scientist and also to the amateur.

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3. GENETICS AND BREEDING

THE ATTRACTIVE MINIATURE AMARYLLIS

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For sheer mass of color, the large-flowered Amaryllis hybrids are of course unsurpassed, but for graceful charm and intriguing possibilities in form and color, the smaller-flowered hybrids reign supreme. True, there are not many miniatures on the market today, and few of them are very graceful, but the ruffled miniatures that have been showing up in some of the writer's crosses are among the most graceful flowers that he has yet seen. It is also very probable that the first true yellow hybrids will be in this Miniature division, perhaps through the Senorita hybrids, or the yellow species recently introduced. It is rather surprising that the large bulb growers have not developed the miniature hybrids to any great extent, for they are ideal in making corsages and table center-pieces, useful alike to florist and hostess. They attract considerable attention at every flower show, and it is quite evident that their popularity is increasing from year to year. The writer found himself in the field of miniature hybridizing more by chance than by choice, since his first crosses with *Amaryllis striata*, made to secure recurrent bloomers, have given him many miniature flowers. In fact, the majority of his crosses prior to 1969 either have or will produce flowers belonging to the Miniature or to the Belladonna divisions.

Perhaps the term ''Miniature'' should be clearly defined, since it has been used rather loosely in the past. It is now being recommended that only those flowers measuring 4″ or less across the face of the flower be included in this division, larger flowers being classified under the Belladonna-type division. To this definition the writer conforms, with one slight modification; he has also included those flowers whose tepalsegs are so reflexed or ruffled that even though they may actually measure up to 4½″ in diameter, they give the appearance of being much smaller. In fact, the reflexed or ruffled condition of the tepalsegs often shows a marked increase after the flowers have been open for a day or two, thus making them not only more graceful, but often smaller in size. It should also be remembered that the size of the flowers may vary somewhat from year to year, depending upon the vigor of the bulb at blooming time. Therefore, some clones are always going to be borderline cases, and this should be taken into consideration when classifying the flower.

Thus far, twenty-one of the earliest crosses made by the author have produced miniature flowers, although six of these twenty-one crosses have also produced hybrids with larger flowers which would have to be placed in the Belladonna division. When these twenty-one crosses were analyzed, some interesting facts emerged. It was found that *A. striata*, primarily the variety *fulgida*, was directly involved in seventeen of them; so these hybrids could almost be called ''Striata hybrids''.

Also, two Indian Miniatures, one scarlet in color and one a very dark red, were involved in twelve of the crosses. The ruffled flowers have all come from crosses having the dark red Indian Miniature as one of the parents, usually the seed parent. The old Houdyshel orange-scarlet hybrid was also involved in ten of the crosses, and South African or Dutch hybrids in eight more, with various other hybrids only being used once. In addition, seven other crosses not made by the writer but raised by him from seed, have produced miniature flowers. Included in this group are the ''Peruvian Miniatures'' raised from seed secured from R. D. Goedert. The clones raised from these twenty-eight crosses have bloomed in various months of the year, extending from January to October, with most of them blooming in April. All that bloomed naturally in January or February had *A. striata* as one of the parents, and this was under outdoor growing conditions; in a greenhouse they would probably bloom even earlier, and might be recurrent bloomers. The shape of the flowers has also varied considerably; some had plain tepalsegs of trumpet shape, some had tepalsegs which were much reflexed and even twisted, and some were highly ruffled. The best one to bloom in 1968, a dark scarlet ruffled miniature, was pictured and described in the 1969 Year Book, and several others have also been described previously. Five more crosses, worthy of mention, have bloomed in the past year, and here is a brief description of them.

The best one of the five had the dark red Indian Miniature as the seed parent, with the pollen coming from a cross between the scarlet Indian Miniature and *A. striata fulgida.* The flowers were slightly over 4″ in diameter but the tepalsegs were both reflexed and ruffled. They were a light scarlet in color, with a small chartreuse green star in the throat, blooming in April, and were almost as beautiful as the dark scarlet one that bloomed in 1968. Another bulb of this same cross also bloomed this year, with flowers very similar in color, but having a much longer trumpet.

The second miniature of the five had *A. striata* var. *striata,* as the seed parent, with the pollen coming from a cross between the Houdyshel hybrid and a dark red Mead (?) clone. The 4″ flowers in April plainly revealed their species ancestry, with tepalsegs that were much reflexed, but it was their color that made them so attractive. This was a vivid crimson with a small yellow star in the throat, edged with dark red. The reverse of the segs was a blend of red, green and brown.

The third cross worthy of mention was a cross between the Houdyshel hybrid and a Peruvian Miniature. Reference was made in the 1968 Year Book to this cross, and particularly to the unusual appearance of the leaves which were very thick, a grayish green in color, and quite hardy. The first two bulbs have just bloomed, both in April. The first one had 4″ flowers of excellent shape, with broad overlapping tepalsegs and just slightly reflexed. In color it was a dark red with a large dark green throat, the reverse being a dark red with green ribs. A pot of this with several scapes in bloom would make a real sensation at the Christmas season, since all who viewed the flowers were reminded of ''Christmas''. The second bulb had even smaller flowers, but somehow did not seem to be quite as attractive as the first one. However, it did set seed with pollen from both *A. starkii* and *A. evansiae,* which trait makes it very useful in breeding work.

The fourth miniature came from a cross between the dark red Indian Miniature and a Senorita hybrid. Only one seedling of this cross has bloomed so far, but it was sufficiently different and attractive to arouse hopes of what may come from other crosses made with the Senorita hybrids. This flower was slightly over 4″ in size on a 10″ scape, and bloomed in April. The color was a pale red with *a decided yellow cast to it,* and the throat was *also yellow,* but each tepalseg was edged with a narrow strip of white, and this white edging was very prominent on the reverse side. The shape of the flower could be improved for the bottom segment was very narrow, although all were somewhat reflexed and ruffled.

The fifth one of these crosses would never win a prize in a beauty contest but it was decidedly unusual. The seed parent was a hybrid between the dark red Indian Miniature and *A. striata fulgida;* the pollen parent was one of the Calyptrata hybrids originated by Mr. Quinn Buck. These hybrids are supposedly sterile, but this flower was proof that at least one cross has been successful. The flowers were only 3″ in size on a scape about 7″ tall, with very small foliage, and blooming from a bulb only 1¼″ in diameter. These flowers were in fact much smaller than either of the parents, and clearly resembled a species; there was little or no overlapping of the segments, and they would probably be considered a long-trumpet type of flower. However, they did not display the ''Swan's neck'' so typical of Striata hybrids. In color, the flowers were a red orange with a fairly wide pale greenish white stripe on each of the tepalsegs, extending from the base of the throat to within one inch of the tip of each seg. This cross bloomed in October, which trait may come from the Calyptrata hybrids, since the two clones of these in the writer's possession do bloom in the late summer or fall under outdoor culture.

Several years ago a friend in Pasadena gave to the author one bulb of a cross between *A. striata fulgida* and a Boshoff-Mostert clone named 'Skildway'. This also has proven to be a beautiful miniature, blooming in the fall under outdoor culture. The flowers are almost 4½″ in size when they first open up, but the tepalsegs soon become so reflexed and even twisted that they appear to be much smaller. They are rose red in color and have a small green star in the throat, the reverse side being a blend of salmon and white. The Striata ancestry is clearly seen in the size and posture of the flowers, in the leaves which are very wide and short, and in the shape of the bulb. The 'Skildway' pollen parent has contributed the color and good shape of the flowers. Under greenhouse culture, this clone would make a beautiful pot plant, probably evergreen and recurrent-blooming, since it has bloomed in August, and in October, and tried to bloom in January.

In the next few years, the writer expects to see a constant procession of new miniatures. Some forty-eight crosses made prior to 1969, which have not yet bloomed, should produce miniature flowers. The parentage of these crosses is quite varied, with many interesting hybrids and species having been used, the objectives always being to produce either ruffled flowers or pastel colors, particularly yellow or lavender. This spring (1969) four small-flowered species, *A. evansiae, A. starkii, A. argilagae,* and a pink *A. belladonna,* were used in various crosses, but only a few of these were successful. However, many of the writer's bulbs have been very slow in starting to grow this spring, and on June 1st a number of scapes are still just coming, plus those which naturally bloom later in the year, thus providing many more opportunities to work toward the attractive miniature Amaryllis.

HYBRIDIZING WITH AMARYLLIS SPECIES—1969

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In species hybridizing, there are many failures scattered in with the successes. For me, 1969 was a year with a few successes and a number of failures, some of which should be recorded.

POLLEN FROM SOUTH AMERICA

Sometimes, success and good luck come mainly from having good friends. This was the case when I was very fortunate to receive pollen of *A. fosteri, A. tucumana* and both the yellow and red forms of *A. aglaiae* direct from South America from Mr. J. L. Doran during October, 1968. *A. forgetii* and *A. yungacensis* were the first species to flower for this season in Baton Rouge in December, 1968, and January, 1969, respectively. Since each had only two florets, mixed pollens were used; small amounts of pollen from *A. fosteri* and the yellow form of *A. aglaiae* were mixed; similarly *A. tucumana* and the red form of *A. aglaiae.* The fosteri-yellow aglaiae pollen gave viable seed and fairly vigorous seedlings with both *A. forgetii* and *A. yungacensis.* The tucumana-red aglaiae pollen gave only one seedling, with *A. forgetii.* While it is hoped that both possible crosses (with each seed parent) were achieved with the fosteri-yellow aglaiae pollen, it is interesting to speculate about which cross was successful if only one was. Since *A. fosteri* is in the aulica group and crosses within this group are generally successful, it appears likely that the crosses *A. forgetii* x *A. fosteri* and *A. yungacensis* x *A. fosteri* were successful. On the other hand, crosses between members of the aulica group and members of the striata or belladonna groups are frequently unsuccessful and therefore crosses with the A. aglaiae pollen (both yellow and red forms) seem less likely to succeed.

Pollen from *A. fosteri* (alone) was used, also, on a wide variety of species and hybrids, including *A. striata* and *'Constant Comment'* (which generally set seed well) without success except for one interesting hybrid which gave four good seedlings. The seed parent was derived from [(*A. evansiae* x *A. aglaiae*) x *A. evansiae*] x sib. This evansiae hyscape and the floral segments are very narrow. These characteristics are similar to those of *A. fosteri,* scapes with 5 or more florets and narrow floral segments. This similarity of characteristics and the successful cross may be (probably are) entirely coincidental but they appeared sufficiently interesting to record. If a species is going to be very difficult to maintain in cultivation (as *A. fosteri* may be), the next best thing is to quickly get hybrids of the species. These hybrids may be easier to maintain and may still retain some of the characteristics of the species. No other successful crosses resulted with any of the other pollens obtained from South America (*A. tucumana* pollen failed with *A. fragrantissima*) although numerous attempts were made. It will be interesting to flower these same species in this country and see if similar results are obtained with freshly desiccated and refrigerated pollen. Delivery of pollen from South America required 6 to 8 days even though it was sent by air mail. This may have been sufficient exposure to ambient conditions to appreciably shorten the viability of the pollen.

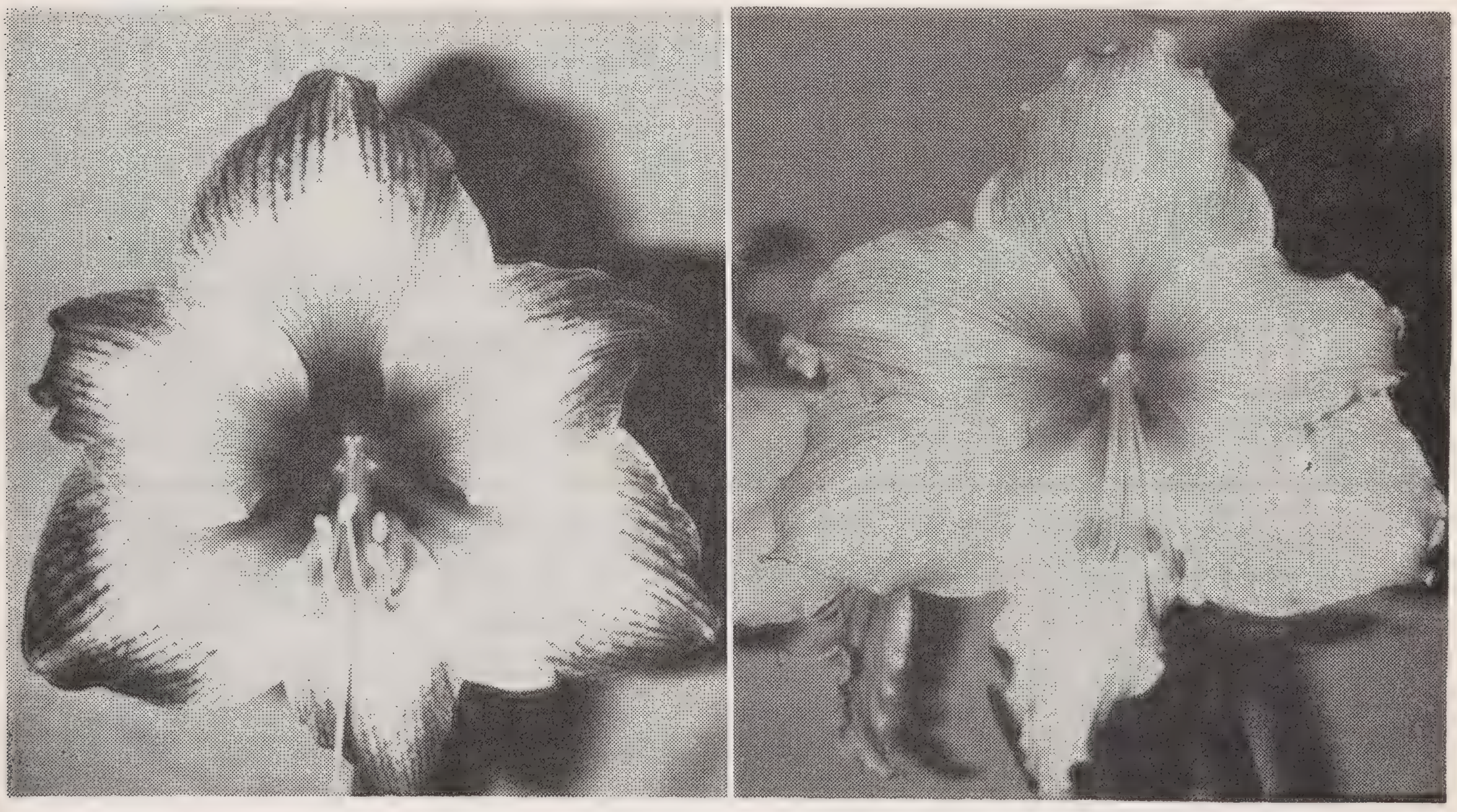

Fig. 26. Left, Hybrid *Amaryllis* ('White Christmas' x *A. yungacensis*). Right, Hybrid *Amaryllis* [(*A. evansiae* x *A. aglaiae*] x 'Maria Goretti'). Note fluted edging. Photos by Fred Buchmann

THE QUEST FOR YELLOW HYBRIDS

In the continuing search for yellow hybrids, eight clones of [(*A. evansiae* x *A. aglaiae*) x *A. evansiae*] x 'Maria Goretti' (cross 655) flowered, generally with two scapes and four florets per scape. None of these intermediate-sized flowers was very yellow; all showed some pale yellow in the throat, especially immediately after opening which changed to light green as the flower matured. The background color was white with all showing some streaking, generally orange-red in color, but one showed a tendency toward lavender-pink streaks (see Figure 26). All eight clones from cross 655 were selfed on one or more florets and 15 to 20 sib crosses were made. From all of these attempts, no seed pods matured or even showed any indication of fertilization. What immediately comes to mind is a sterility allele of the type that inhibits pollen tube growth and prevents fertilization. Apparently to the contrary, pollen from several of the 655 hybrids back-crossed on the seed parent, (*A. evansiae* x *A. aglaiae*) x *A. evansiae,* gave mature and viable seed (3 pods out of 4 attempts) and a number of fairly vigorous seedlings were obtained. Regardless of the theory in this case where self- and sib-crossing failed completely, it appears that back-crossing will be a valuable tool for keeping the line breeding going forward at least one more step.

Also this year, a few seedlings were obtained from each of the following crosses:

[(A. evansiae x A. aglaiae) x A. evansiae] x White Christmas
A. evansiae x seedling from cross 655
A. evansiae x various white leopoldii hybrids.

It will be most interesting in future years to find out whether fertility will be achieved or not in each of the large number of potential crosses offered by these hybrids. The attempts at crossing A. evansiae with various white leopoldii hybrids ('Maria Goretti', 'Nivalis', 'White Christmas' and 'Christmas Gift') were disappointing. Four clones of *A. evansiae* were available and at least two florets of each were pollinated, one floret with pollen from a single white Dutch hybrid and the next floret with premixed pollen from two or more white Dutch. Only one clone gave mature seed pods (4 out of 4 attempts) and the other three clones gave complete failures, 2 out of 2, 3 out of 3 and 4 out of 4, respectively. So all clones of a given species are not equivalent in their seed bearing capabilities as has been pointed out by a number of other writers in the past. Unfortunately, the one fertile clone showed a high tendency toward deformed flowers and, of course, we will have to wait and see if this is passed on to its seedlings.

A. YUNGACENSIS

Another series of puzzling and mostly disappointing events concerns *A. yungacensis* starting with pollen obtained from the University of Southwestern Louisiana in January, 1966. This pollen was used generously on a number of species and leopoldii hybrids with a complete lack of success except for a small, mal-formed pod on 'White Christmas' (cross 619). In view of the general lack of success, it was easy to suspect that this was really a somewhat incomplete self-pollination of 'White Christmas' and to chide oneself for such a carelessness. However, the few seed were planted and four vigorous seedlings resulted.

As the seedlings developed, it became clear that there was much reason to hope that true hybrids had been obtained since their foliage showed a strong resemblance to that of *A. yungacensis* which is quite different from the foliage of 'White Christmas'. All four seedlings bloomed this Spring and any remaining doubt that they were hybrids of *A. yungacensis* was quickly dispelled. Each had two florets per scape and the florets were the same bell shape and color pattern as *A. yungacensis.* The prettiest one was about 6½ inches across with a very large green center blending into white far out on the segments, each of which had a broad red band around the outer edge (see Figure 26). The other three were slightly smaller with more red and less white. Now here was an opportunity for improvement; selfing or sibbing or back-crossing on white Dutch might give larger, flatter florets with four per scape and with a broad picotee-type border (especially if you have lots of imagination). But here again we were doomed to disappointment; no seed pods resulted from any of the selfing, sibbing or back-crossing. Pollen from the 619 hybrids was used on 'Maria Goretti' and 'Nivalis' without success. However, Joseph Mertzweiller used some of this pollen and obtained two seed pods as described by him in an article in this volume. The original pollination of 'White Christmas' x *A. yungacensis* has been repeated a number of times with pollen from a different clone of *A. yungacensis* without success and the same is true for a number of pollinations on other white Dutch hybrids. On the contrary, pollen from this latter clone of *A. yungacensis* gave viable seed this year with 'Constant Comment' (which sets seeds quite readily with most other *Amaryllis* species and hybrids), a clone of SA63-20 x (*A. evansiae* x *A. aglaiae*) from Joseph Mertzweiller and Tarakan (2 pods out of 2 attempts).

If there is a moral to all of this, it seems to be, "If at first you don't succeed, try, try again." It is very easy to arrive at a line of reasoning which suggests that many crosses will succeed in a very large percentage of attempts (frequently approaching 100%) almost regardless of the timing and manner in which the pollination is made. Some clones successfully accept pollen from a very wide variety of species and hybrids; others are much more limited. Some crosses proceed with great difficulty approaching zero percent success. In these cases, it is not clear whether some physical variable (i.e., timing, temperature, humidity, et al.) is responsible for the successes that are achieved. There are a number of theories which explain fundamentally why these crosses fail: (1) a sterility allele, (2) a different number of chromosomes, (3) dissimilarity of chromosomes even though they are of the same number. In some cases, there is not enough information available to determine if No. 2 is a major reason (e.g., *A. yungacensis*). In most of the cases reported here, it appears likely that No. 1 or No. 3 is responsible. It may be possible for the amateur hybridizer to design a program of pollinations which will help elucidate these possibilities although firm conclusions may not be reached without a detailed study of the chromosomes involved. One thing that I have resolved to do is to keep a better record of the failures, and this may be instructive. Similar information on successes and failures obtained by others and reported in this Journal may lead to some useful generalizations.

AMARYLLIS BREEDING PROJECT-1969 REPORT

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By the summer of 1968 it had become apparent that my glass-enclosed patio would no longer be able to contain my amaryllis collection and also serve my family in a functional manner. Since winter temperatures in Baton Rouge do reach levels which would be fatal to species and some hybrids, total outdoor culture is not practical. The only answer was to provide a greenhouse. So by late summer a location on the east side of the house was selected and work began in earnest. The size chosen for this first venture in greenhouse construction was 8 by 16 feet; in retrospect a somewhat larger size would probably have been more appropriate. Redwood 2 x 4 framing set on a reinforced concrete foundation was provided with a 45-degree pitch roof. This was done to facilitate cutting of the roof beams, but other distinct advantages became apparent later. The high pitch roof gives sufficient overhead space that double deck benches can be provided with the upper bench about 6 feet off the ground. The upper bench is ideal for seedling flats. The redwood frame is covered with 40-mil acrylic fiberglas plastic on the outside and 6-mil polyethylene on the inside. An exhaust fan and a 1600 watt electric heater, both on thermostat control, maintain temperatures in the range of 55-90 degrees in winter and spring. The total cost of this greenhouse (materials only) was about $700. The cost can be decreased about $150 by using treated pine lumber in place of the expensive redwood.

Performance of the greenhouse has been generally satisfactory but experience has to be gained in making the transition from the culture previously used to the new greenhouse culture. One unfortunate experience was that the heating facilities were not installed until mid-winter and the collection was subjected to conditions of damp cold. Although temperatures remained above freezing the damp cold is very injurious to certain species and hybrids. Injury was not apparent until it was too late and several plants of *A. striata* and several large bulbs of 'Senorita' were lost.

BLOOM SEASON HIGHLIGHTS

Early in February bloom was obtained on a plant obtained from Dr. Cardenas and identified as *A. belladonna* (variety No. 2 collected by Dr. Cardenas at Rurrenabraque Beni, Bolivia). This amaryllis was received in December, 1967 and had made exceptionally vigorous growth and a relatively large bulb. Growth features were not characteristic of *A. belladonna,* a fact confirmed on blooming. The 16-inch scape bore two 4½ inch florets, almost blood red in color, with much green in the throat and with conspicuous greenish white line markings on each segment, these markings extending to within about one inch from the tips of the segments. In color and color pattern this *Amaryllis* bore some resemblance to *A. yungacensis* but it certainly was not *A. yungacensis.* It was a very striking species and it pleases me to have it in my collection. The mystery as to its identity continued until early summer when I received the 1969 PLANT LIFE. Upon reading Dr. Cardenas' description of the new species, *A. escobaruriae,* my plant was unquestionably this species. Dr. Cardenas collected *A. escobaruriae* in Youngas of La Paz, Bolivia, in July, 1967, and the bulb I received for *A. belladonna* in December, 1967 apparently was mixed in with other bulbs Dr. Cardenas sent to the late Prof. Claude Davis for distribution. My bloom may have been the first bloom of *A. escobaruriae* in this country, and my only regret is that I did not make a more extensive effort to use it in hybridizing. This species grows very well and undoubtedly it will bloom again next season.

Also in February a hybrid of *A. belladonna* var. *haywardii* X *A. striata* made first bloom; the plant was obtained from Mr. Alek Korsakoff in 1967. The 2-inch diameter bulb made two scapes, each three flowered. In color and form this hybrid is closer to *A. belladonna* var. *haywardii* than to *A. striata.* The 4-inch florets were carmine rose with darker rose veining and had the characteristic *A. belladonna* throat markings and flower form.

Several more seedlings derived from a 1965 cross, SA 63-20 X (*A. evansiae* x *A. aglaiae*), bloomed for the first time. The SA 63-20 parent is one of Mr. Goedert's imports belonging to the Belladonna group and which I have described previously. All of these are rather small star-shaped flowers, but they exhibit some of the most exotic color patterns I have observed in any plant species. Describing such colors is virtually impossible, and it is equally difficult to record them photographically. I believe the blends and patterns of color in this group of hybrids rivals or exceeds the coloring of the 'Senorita' hybrids. The most interesting of these hybrids to bloom this season had a picotee color pattern. The 4-inch flower had a greenish-yellow throat shading practically to white along the centerline of the segments, the white blending into pale pink, then blending to a distinct deeper pink border about ¼ inch wide along the edges of the segments. The overall effect is that of a diffused picotee pattern. There is still a dozen or more of this group which have not bloomed. All of the group are highly fertile, a characteristic inherited from the SA 63-20 parent.

Several years ago I produced many seedlings by using my fertile 'Senorita' hybrid or the Morris hybrid as pollen parents on white Dutch varieties. The Morris hybrid is a greenish-yellow hybrid produced by Mrs. Lloyd Morris of Baton Rouge and is believed to have the parentage white Dutch X *A. evansiae.* Most of these seedlings were planted in outdoor beds and the results have been very disappointing. Although the first season's growth was very vigorous, only two or three have bloomed, and only a dozen or so survive. Like 'Senorita' they seem to resent the damp cold of our winters. A few of these seedlings were cultivated in pots and five of these bloomed. All are fairly large 5-6 inch flowers with pale pink ground color and varying amounts of orange veining. Those having the least orange veining are the more striking blooms and these are being used for further breeding as a possible route to large flowered yellow hybrids.

In 1965 I obtained from the late Prof. Ira Nelson pollen from a beautiful rose-pink form of *A. belladonna.* This pollen was used to set seed on 'Nivalis' and 'Queen of the Whites'. Most of the seedlings have been grown outdoors and a few were pot cultured. One of the pot cultured seedlings bloomed with a 2-flowered scape with 5½ inch florets of Leopoldii form. The color was a beautiful and uniform coral orange with the usual *A. belladonna* throat pattern in green and white. The excellent quality of this seedling sustains anticipation of bloom of a dozen or more plants now making good growth in outdoor beds.

First blooms were obtained from a group of seedlings derived from *A. starkii* (1965 pollinations). Two seedlings of the parentage *A. starkii* X mixed pollen from a red *A. belladonna* and (*A. evansiae* x *A. aglaiae*) X *A. evansiae* were light coral pink in color and probably resulted from the (*A. evansiae* x *A. aglaiae*) X *A. evansiae* pollen parent. Neither showed the up-thrust posture of *A. starkii,* the blooms being held in an approximately horizontal position. Another seedling of the parentage *A. starkii* X mixed pollen of 'Marie Goretti' and SA 63-20 was segregated prior to blooming on the basis of foliage characteristics as probably derived from 'Marie Goretti' as the pollen parent. The 5-inch blooms coral-orange in color and Leopoldii form confirm the parentage, but again there was no evidence of the *A. starkii* posture. Finally an F-2 seedling of *A. belladonna* X *A. starkii,* distributed in 1966 by the Louisiana Society for Horticultural Research, bloomed with a single 4-flowered scape. The 3½ inch florets were crimson-rose with *A. belladonna* throat markings. Flower form was much closer to *A. belladonna* than *A. starkii.* These observations suggest (1) the *A. starkii* flower posture is probably a recessive characteristic, and (2) judicious use of mixed pollen is a useful technique in hybridizing with amaryllis species.

Another species which bloomed in late spring was *A. vitatta* (probably var. *vitatta*). The seedling bulb was obtained from Mr. Korsakoff in 1967. This bloom, although in no way disappointing, was not really what I had expected of *A. vitatta.* The scape was 2-flowered. The flowers were 4½ inches across, quite full and orange-red in color with a narrow white keel extending slightly more than half the length of the segments. I really expected more white in *A. vitatta,* and also a more pronounced tepaltube compared to the ¾ inch funnel-shaped tube shown by this bloom. Still, it is not difficult to visualize a plant of these characteristics as a parent of *Amaryllis* x *johnsonii.*

HYBRIDIZING HIGHLIGHTS

In many respects the 1969 season was the most successful I have enjoyed from the standpoint of obtaining seed from a wide variety of species and F-1 hybrids. More than thirty seed pods were obtained from well over a hundred pollinations. But mother nature has already assured that I will not be too badly handicapped by lack of space to grow the seedlings. Less than a third of the seed pods gave good germination (more than 50%), about a third gave fair germination and the remainder germinated very sparsely or not at all. Space and time do not permit detailed comments on these efforts but I will describe a few of the highlights.

Perhaps the most interesting hybridizing experience in 1969 was setting seed with 10-month old pollen of *A. viridiflora* which had bloomed in late spring, 1968. The very small blooms of *A. viridiflora* were described previously (PLANT LIFE, 1968). Since suitable pod parents were not available at the time, the pollen was dried and frozen. The pollen was placed in a cotton-stoppered glass vial and the vial was placed in a screw-cap jar containing a ¾ inch layer of indicating "Drierite" (dessicant). The jar was placed in a food freezer where it remained from May, 1968 until February, 1969. About three days before use the jar was removed from the freezer and placed in the refrigerator. Seed pods were obtained by using this pollen on SA 63-20 and on SA 63-20 X (*A. evansiae* X *A. aglaiae*). Fair to good germination was obtained, but the seedlings are rather non-vigorous growers at this time. Seed pods were also obtained by using mixed pollen of *A. viridiflora* with white Dutch on a white Dutch pod parent, and mixed pollen of *A. viridiflora* and *A. evansiae* on *A. evansiae*. Good germination was obtained and growth characteristics are fair to good; however, it remains to be determined if any of these seedlings resulted from *A. viridiflora* as the pollen parent. This experience shows that techniques can be worked out for storing pollen at least from one season to the next.

The high degree of fertility and striking coloration of practically all of the seedlings derived from SA 63-20 X (*A. evansiae* X *A. aglaiae*) make these seedlings particularly desirable pod parents. Improvements in form and substance are desirable and this is being sought by crossing with appropriate large flowered and small flowered hybrids. Particularly noteworthy are two successful pollinations accomplished in 1969. The previously-described diffused picotee seedling was pollinated with a picotee seedling of Fred Buchmann derived from *A. yungacensis* and a white Dutch hybrid. This pollen parent which is described by Fred in this issue is the most outstanding picotee-patterned amaryllis this writer has seen. A good crop of seedlings of average growth vigor resulted. Anticipated characteristics include the picotee pattern in pastel colors. Towards the direction of miniature flowered amaryllis several successful pollinations were achieved with *A. evansiae* X *A. incachacana* as the pollen parent. The potential here is towards pastel colored miniatures. These seed germinated well and are showing a fair rate of growth.

Although the SA 63-20 X (*A. evansiae* X *A. aglaiae*) parent almost invariably sets seed, the germination of the seed and growth of the seedlings are not always satisfactory. Considerable difficulty is being experienced with germination of seed derived from pollination with white Dutch hybrids. Repeat of an earlier cross which gave only 4% germination now gave only 10% germination. A seed pod was set with pollen of *A. fosteri* but only two of 17 seeds germinated. Growth characteristics are so poor that one seedling has already died and the other is making virtually no growth at all.

The 1969 seedlings showing the most vigorous growth are those obtained by selfing, sib crossing and inter-crossing the hybrids of 'Senorita' and the 'Morris Hybrid' as pollen parents on white Dutch hybrids. All of these should have some potential for producing pale yellow or greenish yellow offspring.

One other highlight of the 1968-1969 season merits mentioning. Through the courtesy of Mr. J. L. Doran I obtained one flowering size bulb and two very small bulbs of *A. fosteri.* These rare bulbs were collected in 1968 by Mr. Doran and represent much time, effort and expense. His kindness in sharing these bulbs with other amaryllis species enthusiasts is greatly appreciated. A few words about culture and performance of *A. fosteri* are appropriate. The large bulb is about 1¼ inches in diameter and is unquestionably flowering size since it contained the remnants of a bloom scape, the smaller bulbs were about ½ inch in diameter. According to Mr. Doran and Mr. Foster the culture of *A. fosteri* has not been successful with bulbs collected in the past by Mr. Foster. At this writing all of my bulbs are making leaf growth. The smaller bulbs have two and one leaves each (leaves about 10 inches in length) while the larger bulb has two leaves 3-4 inches long. Because of the known tendency of this species to rot, direct watering has been avoided. The bulbs were received in late fall and the small bulbs were potted in 2-inch pots and the large bulb in a 3-inch pot using my regular potting mixture. The pots were kept indoors through the winter. Light watering from the bottom of the pots was applied every two weeks. By early spring the bulbs were firmly set in the pots and apparently had made root growth without making leaf growth. In May the pots were sunk in damp sand under the greenhouse benches, and leaf growth began on the small bulbs almost immediately. The larger bulb did not start leaf growth until about mid-summer. I plan to continue this semi-dry culture with this species.

ACKNOWLEDGEMENTS

I would like to take this opportunity to express my appreciation to Prof. William Adee, Mr. Fred Buchmann, Mr. J. L. Doran, Mrs. Ira Nelson and Dr. Hamilton P. Traub for the bulbs and pollen they so kindly supplied.

AN APPARENT SPREKELIA—AMARYLLIS CROSS

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When I was 14 years old, I made an apparent cross between *Sprekelia formosissima* and an *Amaryllis* species; its name was unknown to me, but it belonged to the Striata Group. Only one seed pod developed, and out of the many seeds only three germinated. Finally only one survived which four years later produced the first flower.

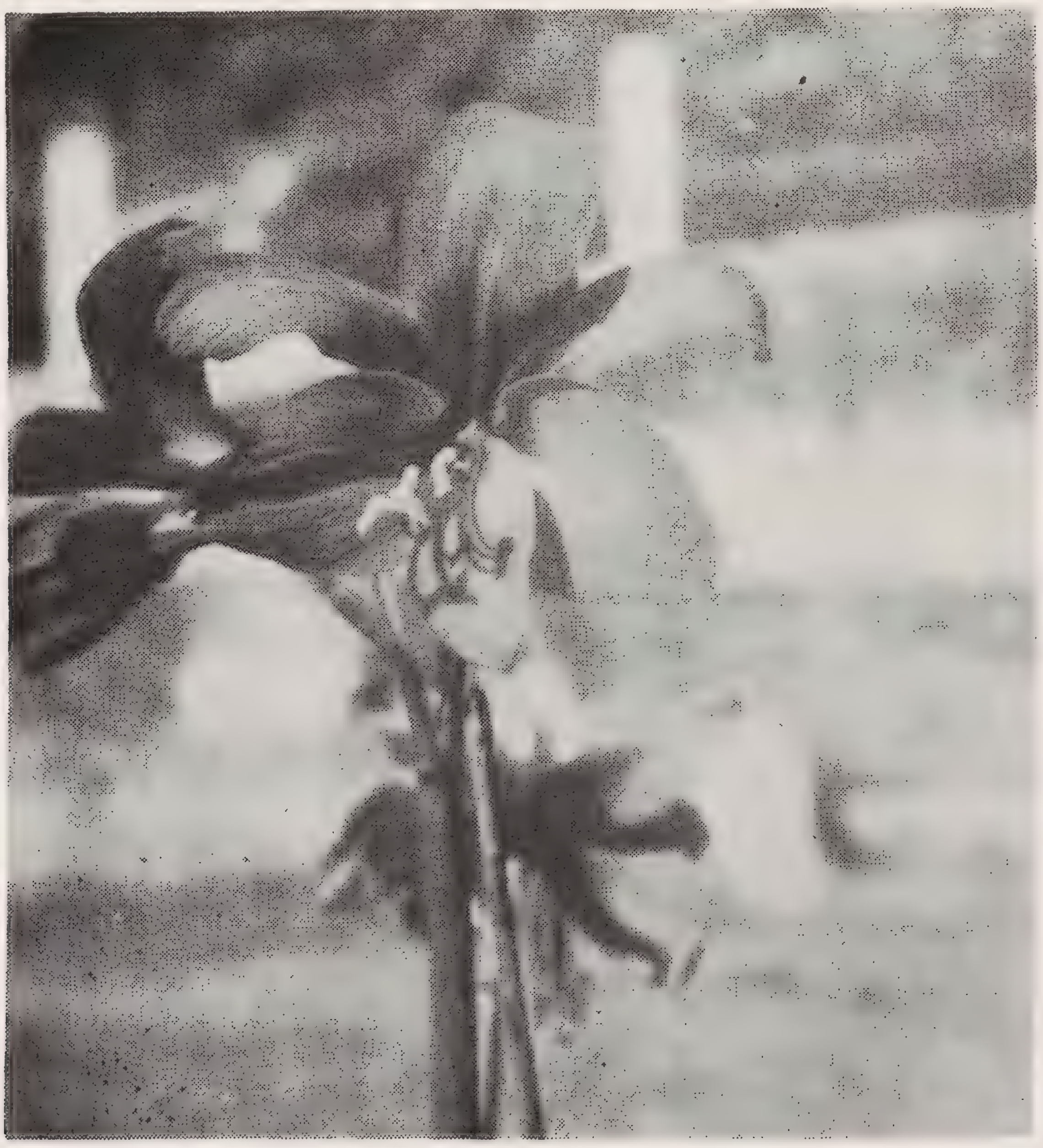

Fig. 27. Reported cross by Udai Chandra Pradhan between *Sprekelia formosissima* and an *Amaryllis* hybrid belonging to the striata group. Photo by B. N. Pradhan, 1969.

Since 1967, it has produced flowers much like those of *Sprekelia formosissima*, but some of the characters are shared between the two parents (see Fig. 27). In size the blooms are much larger than those of *S. formosissima.*

The second generation hybrids of this cross will most likely flower this coming year. My aim is to obtain hybrids with flowers like those of *S. formosissima*, but in various colors as in the Leopoldii *Amaryllis* hybrids.

MODERN SCIENCE AND AMARYLLIS HYBRIDIZING

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In this age of rapidly changing conditions you may wonder if the awe-inspiring discoveries in the chemical, mathematical and biologic fields have any bearing on new methods in developing new *Amaryllis* hybrids and in the growing of them.

Some ten years ago it became the fashion to expose flower seeds and bulbs to X-rays (Röntgen or Becquerel rays are rays emitted by radio-active bodies), but in *Amaryllis* seeds the cobalt (an artificial radio-active isotope, which latter is one of two or more forms of an element differing from each other in weight of atoms) treatment killed the germinating power of the *Amaryllis* seeds, which, to say the least, proved that normal growth (i.e. division of living cells) was hampered or entirely inhibited.

The cobalt treatment was also extensively applied to flowering sized bulbs, including *Amaryllis* bulbs of the Ludwig Strain. After treatment I found that the bulbs bloomed normally without any deviations, so much so that at first I thought that the rays had not affected the bulbs at all.

When crosses, however, were made between flowers produced by cobalt treated bulbs, the seeds developed blooms after three years, which showed great variances.

The object of the cobalt treatment was to cause changes or mutations both in color and shape and with regard to colors there were changes indeed, but then even Darwin nor Mendel, who laid down the laws of whimsical Nature, could probably have stated with certainty, whether the color changes were occasioned by the cobalt treatment or if they were mutations resulting from the whims of Nature.

Anyhow, let us be generous enough to give the cobalt treatment credit for the changes; as to shape the treatment certainly affected the flowers, but unfortunately only adversely. This led me to believe that the cobalt treatment had some influence on the chromosomes, but first allow me to explain the term without being too technical.

Chromosomes may popularly be called the color threads or color rods into which the chromatin (the tissue that can be stained) of the cell nucleus is transformed before cell division (i.e. growth). Chromosomes exist in pairs, called haploids, and two equal haploids make up the diploids.

A modern theory holds that if the number of pairs of chromosomes of the two parents is not equal, the results of a cross is bound to develop into a kind of freak, which accounts apparently for mongolism in the human race.

I certainly had my share of freaks, but having been at the Cobalt treatment only for some nine years, should I have drawn the rash conclusion that I was destroying Nature? Such a conclusion was rather too welcome to me, as I had not accomplished anything at all but upset the laws of heredity, which proved no longer to be applicable in any way. The inference that I committed something against Nature that I should stop, was just a trifle too convenient for me, for I had certainly not tried out all possibilities, which would probably take a life time.

The $10,000 question is: ''What is against Nature''. It is a well-known fact that in nature bees are color-sensitive; if a bee hive is put in a greenhouse full of flowering Freesias, say yellow and purple ones, each bee will pick and choose one color, flying from yellow to yellow, and another bee from purple to purple, thus pollinating only Freesias of the same color, never causing a mix-up, but should we conclude from the bees that it is against Nature to make a cross between a white and a red colored *Amaryllis?* Neither Darwin nor Mendel thought so, otherwise the latter should never have drawn up his color diagram of the probable results of crosses between two different colors. Moreover the bees will occasion a lot of self-pollination, which leads inevitably to inbreeding and degeneration, but though bees merely follow their natural instincts it is generally admitted by celebrated hybridizers that so-called ''selfs'' are taboo in hybridization, as selves will undoubtedly cause disasters in later generations.

Of course, there is no rule without exceptions; a medical friend of mine drew my attention during World War II to a family, whose parents were second cousins; of their numerous offspring of 13 children, eleven landed temporarily or permanently in a mental institute, but two of them were wonder children, prodigies of learning, extremely musical, rather inventive and resourceful, physically normal and mentally adequate. In the botanical world it might prove that ''selfs'' may serve some purpose, provided a conscientious selection is applied later-on, which is quite possible, and therefore highly recommendable in plants.

It is a well-known fact that the famous painter, Henri Toulouse-Lautrec, was born out of first cousins, which probably crippled and deformed him into a misshapen, hideous dwarf, for a simple fall from a horse could hardly account for it; nevertheless his artistic talents were far above those of his contemporary artists. Unchristian and indifferent though it may sound, the human race is not (yet) propagated vegetatively (I put the ''yet'' between brackets, as I recently read somewhere that an Englishman, a Dr. Gurdon succeeded in propagating frogs, not by taking the seed cells of male frogs, but by developing intestinal cells into new frogs, which is asexual or vegetative propagation in animals, to which world we cannot but admit we belong) and therefore we should not allow inbreeding in the human race, until scientists can artificially develop an embryo and fetus, destroying it in time, when it should grow or develop into abnormalcy, to which some may object on moral grounds, but let us return to the realm of plants, where we are not likely to be charged with murder, when we destroy the freaks we have developed.

In *Amaryllis* self crosses or selfs need not ''a priori'' be failures, and once in a while we may come across a really outstanding novelty, if we have a selective taste, but such a novelty is not likely to be an ideal parent for further crosses, and certainly not for another self cross. What is extremely important in self crosses is a relentless selection, so that some super variety may be developed; to select very conscientiously it would be necessary to sow all the seeds from the self cross, and when the seeds have developed so much after three years (after two years there may be some flowers, but they should not be taken as a criterion, as they may still be fairly small) that they bear flowers, to destroy all the plants that have inferior blooms (and they are bound to be a good many). For me this is only part of the selection, for I should then cut up the ideal mother bulb selected, and watch very carefully how many bulbs the ''cuttings'' would produce, whether or not the new bulbs would be liable to disease, especially virus, whether or not the bulbs would grow big enough, whether or not they could be warehoused for some months, so that they are exportable etc. etc.

A clever hybridizer will never burn his boats, but continue growing some of the older varieties, keeping a register of what crosses he made with them, knowing when he committed inbreeding, so that when degeneration sets in and he has come to a dead end, he may fall back upon the older varieties, making another cross where he went wrong.

Above I mentioned the word *Virus,* by which I mainly mean *Mosaic Virus,* which I personally consider the nightmare of any *Amaryllis* grower. In a previous article I did on behalf of Plant Life, I pressed my point and advised all Amaryllis fans *to do away with all virus infested plants.*

This raised a lot of criticism, and as we fortunately live in a democratic world, my advice is not a brazen law, so that any person may grow *Amaryllis,* even though they are badly infested with virus, for virus infested plants will flower in spite of the disease. I certainly did not mean to talk with an air of superior wisdom, but on the other hand nobody should pretend to be able to cure *Mosaic Virus,* for in this case he would most probably have found a remedy against cancer at the same time. As a matter of fact *Virus* may also cause mutations both in color and shape of the flowers, so that some 15 years ago I was tempted to grow some virus infested *Amaryllis* on an isolated spot, making crosses between two virus plants; theoretically all seeds are virus-free, but the plants developed from such seeds whose parents suffered from virus, show ''a great aptitude towards catching the disease.''

The experiment in a nutshell amounted to developing a very fine novelty, which we named 'Spring Dream', but however much care and attention we gave the novelty, we could not eliminate the virus, so that in the long run we had to give up and 'Spring Dream' disappeared. Hundreds of hybridizers have made the same experiment, but as far as I know, none was successful in the long run.

As I stated in a previous feature, *Virus,* though contagious is mainly spread by insects, so that I advised my readers to try and kill as many insects as possible. Twenty years ago everybody believed that D.D.T. was the ideal insecticide, but meanwhile we have learned that when administered to the soil in great quantities, it does great harm to the structure of the soil. Parathion and Undeen seem to be very effective, but they are a danger to all animal life, so that one should proceed very carefully. But is not here a task and challenge for the chemical world to find a better insecticide that is less dangerous for other animal life and does not develop an immune insect strain either?

I do not agree with futurologists predicting that we shall work only some four hours a week in the next century. There is such a tremendous amount of scientific research work to be done. The Horticultural University of Wageningen, Holland, showed the results of X-rayed potatoes on Dutch television last year. Commercially speaking the mutations caused by the treatment were not a success at all, for the potatoes were very unshapely, but then who am I to criticize such experiments, as I applied the treatment only unsuccessfully to some hundreds of *Amaryllis* clones. If the treatment were applied in a far larger way and the data were mathematically elaborated by computerizing them, we might have astounding results. Nobody should be in the way of scientific research, for twenty years ago the moon landing would have been considered impossible (like driving nails into the moon) and all of us saw the impossible come true, when Neil Armstrong hesitantly set foot on the lunar surface.

Lastly I may make two remarks that are rather reassuring: (a) In discovering the awe-inspiring secrets of Nature we should not be too scared to destroy Nature, for Nature will assert itself in the long run; (b) If mutations are freaks and disappointments to the scientist, the younger generation, who has another taste in dress, falls for electronic music, which sounds hideous in our ears; and who rave about paintings that the older generation does not understand at all, may greatly admire them.

One more word about Double Flowering *Amaryllis,* to which I took a fancy, when I was in the U.S.A. Generally speaking I do not fall for the so-called Doubles, neither in Tulips, nor in Freesias, nor in *Amaryllis,* but somehow it is a challenge to me, the more so as the chances of success are 50% less than in single-flowering *Amaryllis.* The Doubles have pollen, but on the whole no pistils, which means that crosses can only be made one way, i.e. we can take the pollen from the Double and put it on a single flower, but not the other way about.

Everybody has his or her dreams, and I have mine thinking that in the far future the whole of the American Amaryllis Society will be co-operative, so that I could put 10,000 seeds from Doubles at their disposal, so that the seeds will be distributed amongst the members that are interested, who will pass their experiences to the A.A.S., who will then computerize the data, so that we could accomplish almost anything in the short space of three years, but then a dream is only a dream.

THE TRUMPET, AND CAMPANULATE 'MILK & WINE' CRINUMS

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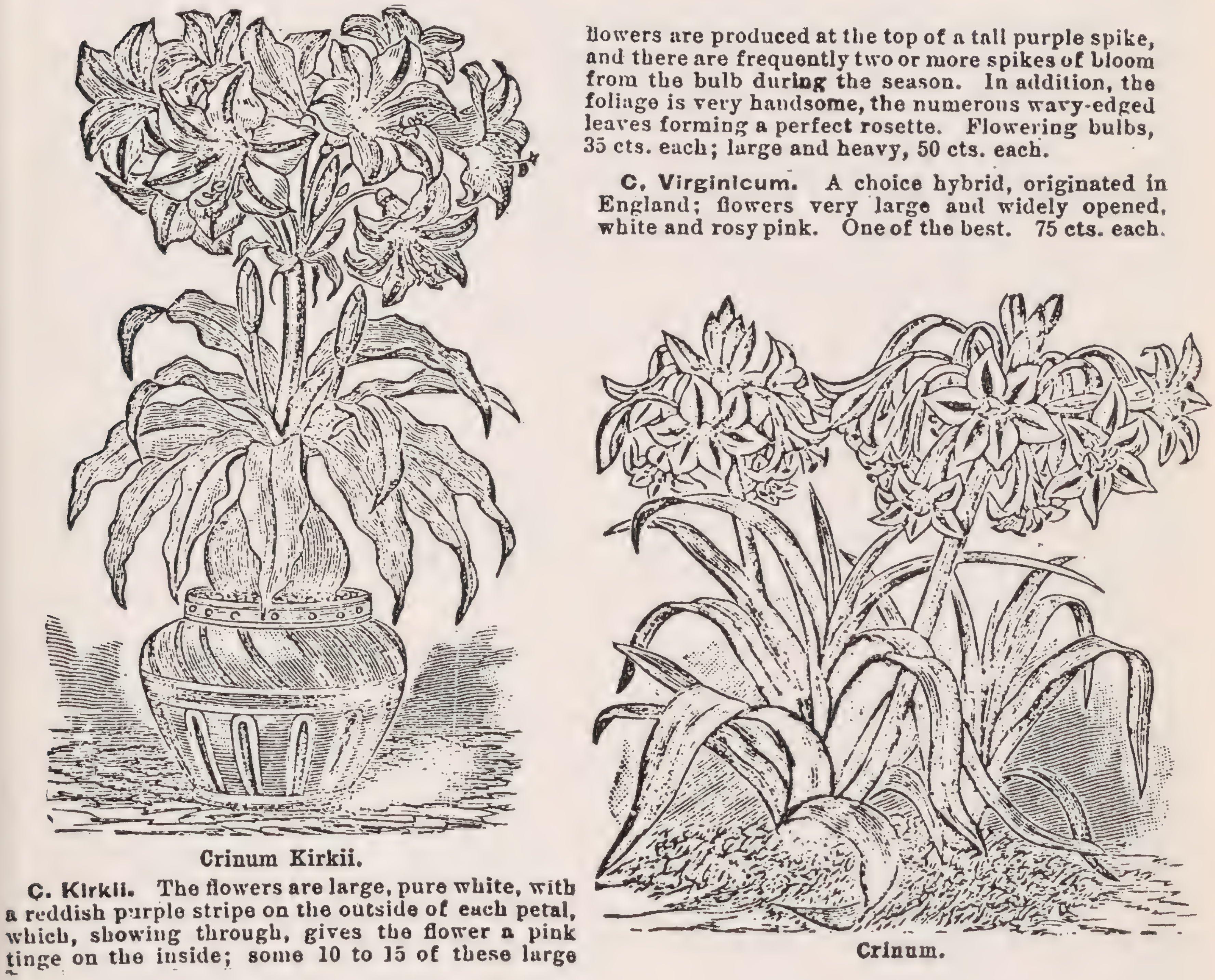
Last year we reviewed the 'Milk and Wine' Crinum which have open or flat faced blossoms that can be accurately identified from old descriptions (Plant Life p. 113 1969). This time we are taking up the trumpet shaped forms with campanulate or semicampanulately shaped blossoms which do not have such patent features. We find these plants far more difficult to trace as all go under assumed species names such as *C. kirkii, C. kunthianum, C. sanderianum, C. campanulatum, C. fimbriatulum* and the like. In general the plants resemble the species but in actuality they are all hybrids. And as far as can be determined no suitable descriptions are available other than what we can glean from early catalogues. These are meagre.

The term 'Milk and Wine' was first used by P. F. Reasoner and his brother (see L. H. Bailey's Cyclopedia of Horticulture, p. 1593) for a Crinum imported from Nassau while they operated the Royal Palms Nursery (1882-1910) near Manatee, Florida. About 1890 this bulb was keyed out erroneously to be *C. fimbriatulum.* Actually the plant appears to be a *C.* x *herbertii* form (*C. bulbispermum* x *C. scabrum*) which is common through the Caribbean (see Fig. 2). As of now the term 'Milk and Wine' applies to any Crinum having white blossoms with red keeled tepals. About ten clonal forms fall into the trumpet shaped campanulates or semicampanulates and appear in the trade under the above species names. As stated all are in error, not a single one qualifies as a species.

What is the proof? Well, in the first place one cannot grow tropical species out of doors in central California. The humidity is too low in the summer heat and the foliage withers. And the damp cold winters cause bulb rot, even in a greenhouse. Most of the trumpet 'Milk and Wine' Crinums are nearly as hardy as the *C.* x *powelli* hybrids. This first suggested that the hardy genes of *C. bulbispermum* are present. Secondly, the foliage of these 'Milk and Wine' forms is longer and far more acutely tipped than that given in any species description or found in any species re-imported. True, even species have some characteristic variants, but the foliage of the 'Milk and Wine' types all resemble the wider forms of *C.* x *powelli* more closely than they do the species, which again suggests *C. bulbispermum* genes. Thirdly, most of the plants rarely if ever set seed which is typical of many *Crinum* hybrids, but their pollen is active and will strike on *C. bulbispermum* giving what appears to be backcross B-1 hybrids. Some of these seedlings are quite striking but leave one lost as to the minor parent. Finally, we have duplicated several crosses using *C. scabrum* and *C. bulbispermum.* This gives some insight into the situation.

As a result we have come to the conclusion that most of the campanulate and trumpet form 'Milk and Wine' represent *C.* x *kirkii, C. scabrum* and possibly *C. zeylanicum* crosses with *C. bulbispermum album.* We can pinpoint *C. bulbispermum album* since the colored forms, *roseum* and 'Kimberley Red', yield solid pink or red hybrid blossoms with uniform shadings not unlike 'Ellen Bosanquet'. Only *C. bulbispermum album* hybrids retain the striped keel of the other parent.



Crinum Kirkii.

C. Kirkii. The flowers are large, pure white, with a reddish purple stripe on the outside of each petal, which, showing through, gives the flower a pink tinge on the inside; some 10 to 15 of these large flowers are produced at the top of a tall purple spike, and there are frequently two or more spikes of bloom from the bulb during the season. In addition, the foliage is very handsome, the numerous wavy-edged leaves forming a perfect rosette. Flowering bulbs, 35 cts. each; large and heavy, 50 cts. each.

C. Virginicum. A choice hybrid, originated in England; flowers very large and widely opened, white and rosy pink. One of the best. 75 cts. each.

Crinum.

Fig. 28. From Reasoner Bros., Oneco, Florida, 1902 Nursery Catalog, page 50. Left, **Crinum krikii**; and Right, **Crinum cl. 'Virginicum'**.

The first *C. scabrum* x *C. bulbispermum album* cross dates back to Dean William Herbert as we find several references to these hybrids in his writings. He sent some bulbs to Dr. Carey in Calcutta, India. Thus, it is possible that one or more clones from this cross of his have remained in circulation. L. van Wavern Company of Hillegom listed a *C. herbertianum* in 1881 which appears to have been from Herberts stock. This well could be the bulb which Reasoner listed as *fimbriatulum.* Another Florida nursery listed the Reasoner bulb in 1898 with erect sword-shaped foliage so we have a fair idea of the plant shape, namely that it is a *C.* x *herbertii* form with semi-erect foliage and fragrant carmine-striped campanulate blossoms. And it produces numerous offsets.

There are several *C.* x *herbertii* clones in circulation with broader foliage which is less semi-erect. These plants carry 20-24 inch scapes with 10-12 blossoms radiating outwards like spokes in a wheel. All buds tend to come into blossom at one time and in most instances the tepal keels are not pigmented more than a light carmine. Just which is which is a matter of conjecture as far as the name mix up is concerned. In the first place we presume that several strains of *C. scabrum* may be about which accounts for some of the minor differences in the *C.* x *herbertii* hybrids; and secondly we are not sure what the *C. bulbispermum* x *C. zeylanicum* crosses would be like. *Crinum zeylanicum* has better than a score of known variants, those from India have smooth margins to the foliage whereas the East African are finely toothed. Hybrids of the latter with *C. bulbispermum* would undoubtedly resemble the *C.* x *herbertii* cross with the shorter scape. Some may exist in the 'Milk and Wine' group and be impossible to segregate. The only clone of significance is one whose tepals have rounded tips which reflex well in a humid environment. Claude Davis lists this clone as 'Gulf Pride'.

The tall scape forms of *C.* x *herbertii* include the *C.* x *herbertii* cl. 'Virginicum' with its starry-shaped, broad-faced blossoms. As we stated last year we can trace this back to England in 1885. Its coloring makes it a striking plant. The *C. campanulatum* of the trade appears to be a related hybrid. It definitely is not the true species and is noted for the way the blossoms tend to droop. Its blossoms lack the span of *C.* x *h.* 'Virginicum.'

The *C. kirkii* x *C. bulbispermum* hybrids bear considerable similarity to the *C.* x *herbertii* hybrids. Where the latter has relatively broad foliage, particularly at the base, and the color is a deep semi-sage green with some evidence of a glaucous sheen, the *kirkii* hybrids have more strap-like foliage which grows rather erect and four to five feet long. The coloring is more of an uranium-green with no glaucous sheen. In background history Krelage and Sons first introduced *C. kirkii* in 1892. Bulbs were distributed into the Caribbean where Reasoner obtained a start. The true species is surface growing and the bulb often gets 10 inches or more in diameter. It is quite frost sensitive. The scape is 30-36 inches in length, not 20 as stated in Bakers description.

In 1900 Reasoner Brothers listed their *C. bulbispermum-C. kirkii* hybrid (see Fig. 28) stating that the bulbs were deep growing and frost hardy. There are several variations of floral size in circulation passing under the name of *C. kirkii* and *C. sanderianum*. The foliage is long and strap-like with acute tips. The blossoms tend to open over a period of several days and have quite a reflexed trumpet. About noon they tend to droop becoming quite campanulate. The keel is quite richly colored. Since the original *C. kirkii* species comes from relatively high elevations in Kenya the hybrid is somewhat hardier than the *C. scabrum* crosses. Like the latter the *C. kirkii* hybrids are seed sterile.

Since we are suggesting evidence that P. F. Reasoner first developed the *C. kirkii* hybrid it is fitting that the hybrid be named after him. It is rather obvious that the hybrid has survived when severe frosts eliminated the species. It's bad enough to confuse the hybrid with the species but to continue to call the hybrid *C. kirkii* is most undesirable.

Crinum 'P. F. Reasoner' *hyb. nov.* L. S. Hannibal (Hyb. *C. bulbispermum alba* x *C. kirkii*).

At the moment the writer has no name to suggest for the *C. bulbispermum album* x *C. kirkii* clone with the smaller blossom. Obviously *C. sanderianum* is in error, but the clone is not worth recognizing.

In describing the above hybrids one will note no mention of bulb size. The writer has one *C.* x *herbertii* clone which yields 20 inch bulbs under ideal conditions. Presumably some of the others approach 15 inches and the *C. kirkii* hybrids may be 8 to 10 inches when properly grown. We also mentioned that the pink or red flowered *C. bulbispermum* species gave red flowered hybrids when crossed with *C. scabrum.* There is no record of such in the older literature but one was found in a Los Angeles garden, and both Thad Howard and the writer have similar plants.

The writer wishes to express a rather delayed appreciation for the assistance furnished by Wyndham Hayward, the late Mr. and Mrs. Cecil Houdyshel, the late Mrs. Grace Primo and many others in trying to unravel the 'Milk and Wine' mess. We also wish to thank Peter Hyypio for locating early historical information.

PLANT LIFE LIBRARY—continued from page 104.

FUNGICIDES, AN ADVANCED TREATISE, edited by Delwayne C. Torgerson. Vol. 1. Agricultural and Industrial Applications, and Environmental Interactions. 1967. Pp. 697. Illus. $29.00. Vol. 2. Chemistry and Physiology. 1969. Pp. 742. Illus. $35.00. Academic Press, 111 5th Av., New York, N. Y. 10003. This two volume treatise covers all aspects of agricultural and industrial fungicides, providing an integrative source of reference for advanced students and research and development workers concerned with the basic or applied fungicide research and development of new fungicides. Volume 1 contains a comprehensive discussion of fungicide usage and application, and the effects of environmental interactions. The chemistry and physiology of fungicidal compounds are discussed in Volume 2. Very highly recommended.

TROPICAL NEMATOLOGY, edited by Grover C. Smart, Jr., and V. G. Perry. 1968. University of Florida Press, 15 N. W. 15th St., Gainesville, Fla. Pp. 153. Illus. $8.50. The objective of the present volume is to compile some of the knowledge pertaining to nematodes in the tropics in the hope that problems in connection with agricultural production and human health may be solved. The topics discussed include some nematodes of the banana, citrus, coconut, pineapple, sugar cane, rice, coffee; nematological problems in the former French tropical African regions and Madagascar; relation of plant parasitic nematodes to soil management practices; and nematode problems of humans in the tropics. Very highly recommended.

RECENT ADVANCES IN PHYTOCHEMISTRY, Vol. 2, edited by Margaret K. Seikel and V. C. Runeckles. Appleton-Century-Crofts, Educational Div., 440 Park Av. So., New York, N. Y. 10016. 1969. Pp. 175. Illus. $9.75. This is the second volume in this series prepared under the auspices of the Phytochemical Society of North America. The topics discussed by outstanding authorities include nuclear magnetic resonance studies of plant biosynthesis; methods of attacking the problem of lignin structure; plant tissue culture as a technique for the phytochemist; utilization of mass spectrometry in natural product chemistry; and scope and limitations of gas chromatography of terpenes in chemosystematic studies. Very highly recommended.

THE BIOLOGY OF PARASITIC FLOWERING PLANTS, by Job Kuijt. University of California Press, 2223 Fulton St., Berkeley, Calif. 94720. 1969. Pp. 246. Illus. $15.00. This is the first general book on the biology of parasitic higher plants and will be welcomed by the scientist and general reader as a reference source. The nine chapters are concerned with parasitic flowering plants and man; the mistletoes, sandalwoods and relatives; broomrapes and parasitic figworts; Rafflesiaceae, Hydnoraceae and Balanophoraceae; **Cuscuts,** Cassytha, Lennoaceae and Krameriaceae; the haustorium; physiological aspects of parasitism; and evolutionary aspects of parasitism. Very highly recommended.

PLANT COMMUNITIES, by Rexford Baubenmire. Harper and Row, publ., Keystone industrial park, Scranton, Penna. 18512. 1968. Pp. 300. Illus. $9.75. Subtitled, "A Textbook of Plant Synecology", this excellent new text on plant communities as components of ecosystems, is aimed at understanding how these communities originate, develop, and maintain themselves, and at elaborating a classification to show relationships. The subject matter is grouped under the headings, the nature of plant communities; analyses and description of plant communities; plant sussession; vegetation and ecosystem classification; and vegetation as an objective of study. Very highly recommended.

ADVANCES IN PEST CONTROL RESEACH, edited by R. L. Metcalf. Vol. 8. 1968. John Wiley & Sons, 605 3rd Av., New York, N. Y. 10016. Pp. 255. Illus. $15.00. This 8th volume in the series contains contributions by outstanding specialists in the fields covered, including not only comprehensive reviews but also critical evaluations of new concepts and developments. The subject matter has been selected from recent significant research trends related to all phases of pest control, with emphasis on the fundamental aspects, including behavior and fate of s-triazines in soils; insect sex pheromones; and the bipyridylium herbicides. Highly recommended.

THE POCKET ENCYCLOPEDIA OF PLANT GALLS IN COLOUR, by Arnold Darlington. Philosophical Library, 15 E. 40th St., New York, N. Y. 10016. 1968. Pp. 191. Illus. $7.50. This pocket-sized, profusely illustrated (in color) cyclopedia of plant galls will be welcomed by the student, teacher and amateur naturalist. It provides a means of identifying plant galls; outlines the mode of life of the principal gall-causing agents, and suggests investigations which can be carried out in the field. The colored illustrations alone are worth the price. Very highly recommended.

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4. AMARYLLID CULTURE

[REGIONAL ADAPTATION, SOILS, FERTILIZATION, IRRIGATION, USE IN LANDSCAPE, DISEASE AND INSECT CONTROL, ETC.]

OUTDOOR PRODUCTION OF AMARYLLIS SEEDLINGS

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Our interest in raising *Amaryllis* from seeds started when we moved from Indiana to Florida in 1948. From seeds saved from a beautiful unnamed specimen, we had started a group of seedlings in an old style coffee can in which a hole had been punched in the bottom so that a wick passing through it provided a continuous supply of water by capillarity from a receptacle underneath.

This seemed like a good method but little did we suspect that our interest in *Amaryllis* hybridization would expand to the point where it would become limited not only by the number of available coffee cans but by available indoor space and our capacity to handle hundreds of containers.

I. GERM PLASM: BREEDING MATERIAL

How we acquired the basic materials for a hybridization program resulting in a considerable number of lots of seeds each year is a story in itself, but briefly we tried to assemble as many different forms of *Amaryllis* as we could and to test their ability to survive under outdoor conditions in Florida.

Being weak on taxonomy, we cannot say with any accuracy just how many species and clones were involved. There were representatives of the Mead strain, *A.* x *johnsonii, A. belladonna, A. striata fulgida* and a form known locally as *A. rutila* (= *A. striata*) but whose characteristics seemed to fit not too well the description of *A. striata* although it perhaps could be a form of this species. Also involved were a few McCann doubles including 'Helen Hull'. Yet to be heard from as mature flowering bulbs are numerous young seedlings from pollinations with *A. aulica, A. aulica platypetala, A. elegans, A.* x *ackramanii* and a clone of bulbs traceable through several intermediaries to the late Professor Ira Nelson and believed to be Senorita hybrids. Pollinations were also made with some undetermined species supplied by Mr. Robert Goedert.

As the outdoor material increased in quantity and flowering capacity, we embarked on a program of upgrading the flower type by using the best Dutch germ plasm available. Each season we would order a few of the best Dutch clones and use their pollen on the heterogeneous outdoor material. Fortunately, the new bulbs, fresh from Holland, would come into bloom just ahead of the outdoor material, and we would carefully husband the pollen supply and use it sparingly in order to stretch its use as far as possible. To accomplish this, we dried the anthers carefully on a small square of aluminum foil in a low humidity air-conditioned room. Then, with two pairs of fine-tipped forceps we would strip off the pollen onto the foil and scoop up all of it into a size 00 Gelatin capsule (obtainable from any prescription druggist). The capsules were then stored in a refrigerator while not actually being used. A word of caution about accidentally wetting the capsules with dew or rain drops is in order. Otherwise, they will soften and collapse.

The bulk of the pollen can be accumulated in the bottom half of the capsule after it has been shaken in order to coat the sides with a thin layer. Patches of this layer can then be rubbed off by inserting one or more of the lobes of the stigma. In this way, it is possible to make a hundred or more pollinations from a single Dutch bulb, especially if it should produce two four-flowered scapes.

We have thus spread far and wide the pollen of 'Goliath', 'Ludwig's It', 'Winter Carnival', 'Bouquet', 'Gypsy Giant', 'Silver Lining', 'Salmon Tower' and others, and now we feel that some of our newer seedlings, having generous amounts of Dutch germ plasm, are as good as their Dutch ancestors. We like to think also that we have some new combinations of floral characteristics not offered as commercially available clones, and that we have made some progress in flower form and structure beyond the usually available types.

II. THE PLASTIC-FRAMED WINDOW METHOD

Realizing that outdoor seedling production would be the only way we might expand our operation, we began to explore ways and means of growing seedlings without the arduous hand labor of weeding and cultivating. Our explorations led to three methods, each of which offers certain advantages so we shall attempt to describe them all.

The first method: It occurred to us that one might make use of *black polyethylene plastic film* such as has been used so successfully for vegetables, strawberries and other row crops. Instead of using the heavier four and six mil thicknesses commonly employed for soil fumigation, we decided upon the cheaper and completely expendable 1.5 mil material obtainable in three-foot width at certain garden supply stores at less than $15.00 per roll of 1000 linear feet.

Strips of three-foot wide plastic were laid out over a lightly moistened, smoothly prepared seed bed and their edges sealed by covering them with packed, wet soil from the pathways between the strips. The delivery tube of a methyl-bromide dispenser (also obtainable at garden supply stores) was inserted under the edge of the plastic in the center of every thirty feet of bed and a can of pressurized methyl-bromide discharged through it. The delivery tube was then removed and the opening sealed by compacting the soil over it.

Ordinarily at temperatures of 65 degrees F., or higher over a period of twenty-four hours or longer is sufficient time for fumigation and the bed is ready for planting.

To assist with the planting operation, one should construct a two to three inch deep rectangular frame with thin wood or metal strips.

A convenient size is eight by fifteen inches. An eight inch long piece of the framing material should be cut for use as a movable partition. It then becomes possible to use the form as a guide to cut out rectangular windows in the plastic and the size of the rectangles can be varied by moving the partition in order to cut out larger or smaller eight-inch wide windows as needed to accommodate larger or smaller lots of seed.

With the frame still in place, a single lot of seed is spread out over the area of soil in the window created by removing the cut out plastic cover. With a little practice, one can learn quickly to judge what size window will be adequate to allow a given lot of seeds to be planted one layer deep with little or no overlapping of their membranous edges. The seeds are then covered with sand or sterilized soil to a depth of about three fourths of an inch.

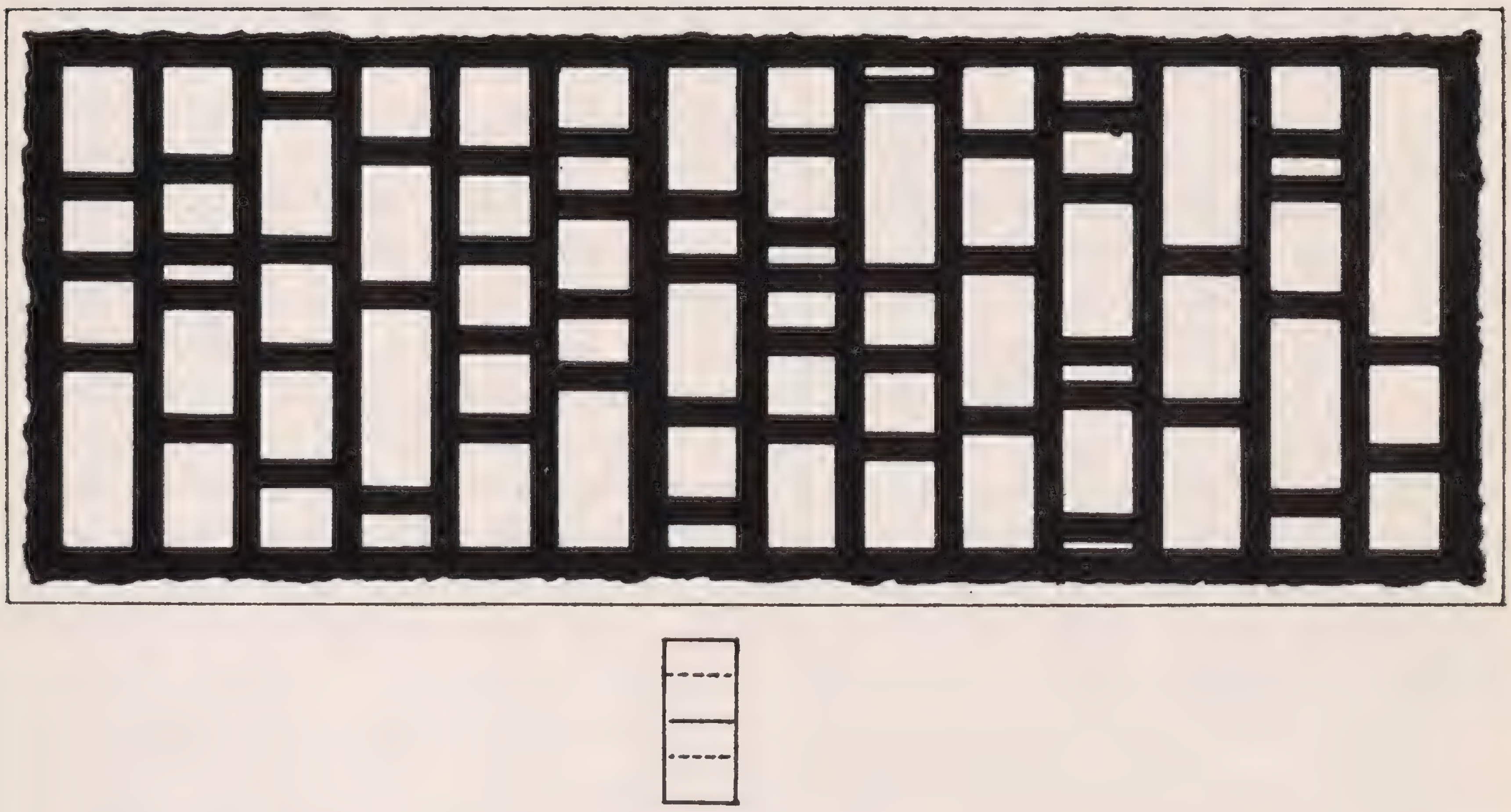

Fig. 29. Scale representation of a black polyethylene-covered (3′x14′) bed with 8″ windows of various lengths cut out to accommodate seed lots of various sizes. The small rectangle above indicates the inside dimensions of a frame with a snug fitting moveable partition for use as a guide in cutting the plastic and for confining the seeds during the planting operation. Plastic framed-window method.

The planted rectangles should be separated by about three inches of intact plastic film. After the bed is planted, these three inch strips should also be covered so as to prevent the soil from washing away from the seeded areas. Thus, after the bed is planted it will have the appearance of an ordinary planted seed bed with no plastic exposed. Daily wetting about 1:00 P. M. will keep the surface layer of soil from drying out until the seeds germinate.

Reasonably satisfactory weed control can also be obtained with the plastic, without previous sterilization, if one covers the seed bed with a weed seed free medium such as builders' sand or a sandy subsoil taken at some depth below the top layer. A three fourths inch layer of such a medium will allow *Amaryllis* seedlings to emerge but will usually discourage the germination and emergence of most of the small-seeded weeds, some of which require light to satisfy conditions for germination. Weed-free peat is not recommended because of the danger of slime-mold growth which occurred in our experience when the peat cover was kept continuously wet for a long enough period to ensure germination of the *Amaryllis* seed. Naturally, some weeding will be necessary but this is minimal and the Amaryllis seedlings will soon take over.

Seedlings thus produced can generally be left in place for two growing seasons, after which each lot will usually be represented by a dense cluster of small bulbs which have invaded the three inch wide strips separating the different lots. At this time these clusters should be separated and transplanted.

III. THE PAPER SANDWICH METHOD

Although the above method has been eminently successful, we soon found that we preferred an alternative method out of deference to an aching back. We found that stooping to spread carefully on the ground the individual lots of seed from upwards of 500 crosses, self pollinations and open pollinations (likely to be naturally selfed) was too taxing to the sacroiliac.

Necessity being the mother of invention, we finally came up with an idea which enabled us to take care of the most arduous aspect of the planting operation while sitting down comfortably indoors while casually watching TV in the usually vain quest for an entertaining interlude between commercials.

Basically, the method consists of spreading the seeds out on a single one-ply section of paper towel and covering with a second, to form a sandwich composed of two plies of absorbent paper with a layer of *Amaryllis* seeds between them. Sandwiches of different sizes can be made by folding a single ply or by allowing two or more sections of towelling to remain attached to each other. It is also feasible to place more than one small lot in the same sandwich if the lots are reasonably spaced and each identified with a small piece of plastic label.

Sandwiches of the same size can be constructed one on top of the other and the pile placed in a rectangular container such as a plastic dishpan so that it can be wet thoroughly with water. The water should not completely inundate the pile, for the top layers may tend to float with resultant complications. Any excess water should be drained off, but the papers can be kept moist for four or five days or even longer if the seeds show no signs of either advanced germination or incipient spoilage. The wet sandwiches, either before or after germination has just started, can be lifted off the pile and laid out on a previously prepared seed bed. After covering with three fourths inch of soil, the bed can be maintained as previously indicated.

For very large bulked lots of seed, it proved to be entirely feasible to make large sandwiches between two opened out sections of newspaper laid out on a waterproof flat surface. Sandwiches this large are extremely subject to tearing as wetting weakens the paper and contributes to its weight. It was found, however, that these large sandwiches could be folded several times before attempting to lift them, and then unfolded again after placing on the seed bed.

As already pointed out, one signal advantage of this second method is that the most arduous facet of the planting operation can be circumvented and the careful arrangement and proper spacing of the seeds can be done while seated indoors when it may be too dark outside or the weather too inclement. Also, the papers can be laid out quickly while maintaining the already predetermined optimum seed spacing.

Another advantage is the complete elimination of the wind hazard which can sometimes be a problem when trying carefully to sow light and membranous seeds. This applies especially to the large bulk lots where the wet newspaper safely keeps the seeds from blowing around.

Ordinarily we plant all of our bulked seeds, as well as the smaller individual lots, immediately after harvesting, but the year before we developed the newspaper technique, we were unable, because of the pressure of other matters, to get sufficient space ready. Having learned about the general inability of Amaryllis seeds to retain viability when stored at ambient room temperatures, we put two large grocery bags full in an old refrigerator and kept them there for a full year. When they were finally brought out and planted beside the new crop, there was no indication that there was any differences in the stands of the two lots of seedlings obtained. Both lots were planted as newspaper sandwiches and the newsprint ink appeared to have no adverse effect on germination.

IV. SINGLE ROW METHOD

After a consideration of the two methods just described, one might wonder about the need for further experimentation along this line. Both of these methods, however, involve the production of seedling bulbs in such dense clusters that it becomes imperative to separate and transplant them after the second growing season. While it is not unreasonable to assume that this should be the inevitable result of any extensive seedling production in limited space, and we will describe later our handling of this phase of the operation, we had the additional thought that a third method might even eliminate this stoop labor so that it might thus become possible to produce seedlings in such a way that they could be left in place three or more years until flowering.

If seedlings could be produced *in a single row at close spacing,* the enlarging bulbs could push each other aside in a more or less zig zag fashion toward the center of the area between the rows. It remained then to devise a method of planting in a single line with some precision. The obvious one of placing the seeds by hand in a single file was immediately vetoed by the sacroiliac. Finally, we came up with the idea that the seeds might be placed individually on ¾-inch masking tape. Knowing that doing this at the fastest possible rate would be time consuming, we had to consider the time involved in comparison with that which might ultimately be saved in bypassing the transplanting operation. Our decision was that there would indeed be enough of a saving to justify at least an effort to explore the method's potentialities.

We, therefore, devised a mechanism which involved two small wheels mounted on a board in such a way that the original reel of tape mounted around one of the wheels was fed onto a second reel mounted around the other wheel with about a foot of the exposed adhesive surface facing upward between the wheels. The receptor reel was equipped with a flat cardboard plate on each side to prevent the tape from slipping off. The seeds were then taken individually from a shallow container and placed in single or zig zag file on the tape as it was rolled from the original reel to the receptor reel, and a small piece of plastic label was placed at the end (which will be the beginning when the tape is unwound for planting) for identification purposes.

In our operation the seeds were placed closely enough that their membranous edges were touching, leaving thereby one half to three fourths inch between adjacent germinating seedlings. Wider spacing could, of course, be used at one's discretion but allowances should be made for the total amount of space available as well as the possibility of something less than 100% germination. The seed-laden tape was then laid in furrows 14 inches apart separated by foot-wide strips of 1.5 mil black plastic.

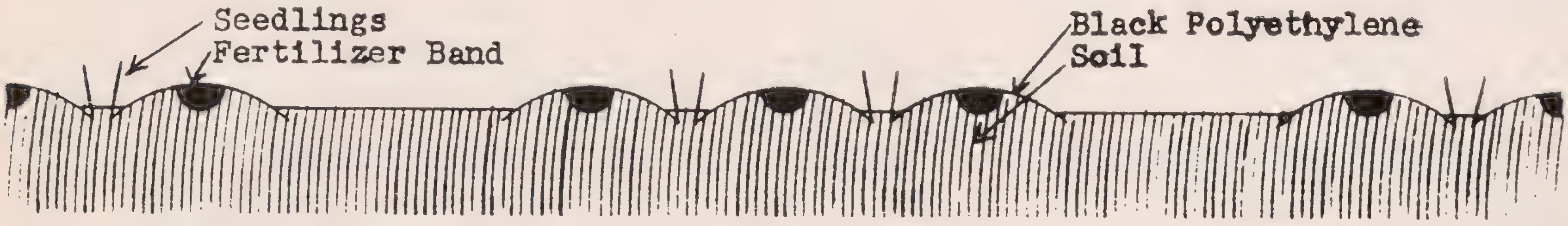

Fig. 30. Profile showing position of seedlings, fertilizer band and black polyethylene film. Single row method.

Due to the varying germinability and vitality of the various individual lots of seeds, our results from this method were likewise variable. Some lots gave good stands, indicating nearly 100% germination; other lots had low germination percentages, leaving wider spacing between the surviving seedlings; still other lots were weak germinators or ill-adapted to outdoor culture and, therefore, failed to survive without coddling or protection from pests or the elements; and finally there were some empty spaces due to inferior lots of seed apparently incapable of germination.

All things considered, however, this appears to be a method worthy of further consideration especially if one were to sterilize the seed bed, which we did not, and otherwise extend the tender loving care which we neglected to do, because of other more demanding personal considerations.

While we believe that this method could result in significant time saving in the overall picture, in that the time necessary is more than compensated for later on, we could not use the method as extensively as we would have liked. The number of lots we usually have after our spring harvest is too large for us to get them all planted by this slower method in time to take advantage of the immediate growing season. We have, therefore, abandoned this method for the present until such time as retirement may permit us to renew efforts to take advantage of it. For the present and the near future, we will continue to use the paper sandwich method as the one which best combines convenience, ease of manipulation, speed and whatever degree of precision spacing one may desire.

In connection with the seed tape method, we mentioned that the tape was placed in furrows fourteen inches apart with the area between almost totally covered with foot-wide strips of 1.5 mil thick black plastic. In creating the furrows, they were purposely made deeper than necessary for planting the seeds at optimum depth. We did this in order to draw sufficient soil toward the middles so that their level would be raised appreciably above the level of the remaining only partially filled furrows after the seed-laden tapes had been covered to the three fourths inch depth. The result of this then is a series of immediately adjacent fourteen inch wide ridges which when covered with the foot-wide plastic strips will leave a lower uncovered area two inches wide for the emergence and development of the seedlings. We use essentially the same method for planting established seedling bulbs except that a wider spacing of 20 inches between the rows is used with the middles covered with 18 inch plastic strips.

The purpose of this was to direct the drainage from rain or overhead irrigation from the centers toward the furrows. Ordinarily one might expect the soil to wash into the incompletely filled furrows covering the seeds or seedlings beyond their optimum depth. This is, however, prevented by the plastic which keeps the soil from washing. The plastic also protects a band of commercial fertilizer which is placed on top of each ridge before the strips are laid. We put down a heavy band of a 10-10-10 analysis, completely inorganic. To facilitate this, we placed a section of two inch rigid plastic pipe on the soil in the center of the ridge and, pressing down, created a furrow in the top of the ridge into which we poured the fertilizer. One need not fear that the presence of such a heavy band of highly soluble salts will kill the seedlings, because the plastic, in covering the band, prevents the rain or irrigation from washing the fertilizer directly toward the seedlings. What apparently happens is that the fertilizer moves only very slowly toward the plants by capillarity and in becoming slowly available has lasting ability comparable to that of the organics.

Since there are some problems associated with keeping the plastic strips in place, a word about our experience is in order. We found that it was impractical to try to cover the edges of twelve or eighteen inch wide strips with soil but that the ends of the strips could be anchored by burying them. We used various devices to keep the strips in place until the overhanging Amaryllis leaves became large enough to take care of the situation. We weighted down the strips with any natural litter we could find such as sticks, pieces of wood, moss, grass clippings, etc. Where neatness was a factor, we fashioned wire staples which we pushed through the edges of the plastic into the soil. Plastic laid in cold weather can be stretched snugly, for it will only loosen somewhat when the weather gets warmer, but plastic stretched tightly in warm weather may contract sufficiently to tear if there is a severe drop in temperature.

V. THE VIRUS DISEASE PROBLEM

Apparently one way to keep ahead of the virus problem is to have an abundance of new seedlings coming into flower each year. For a few years at least they remain free of the disease until a new disease-free crop comes into flower. Through the years we have lost many beautiful *Amaryllis* to virus, in one case a full double measuring nine and one half inches across. We have been somewhat philosophical about this, realizing that such superior germ plasm is being passed along to new crops of seedlings yet to be heard from. We are in the midst of an *Amaryllis* population explosion and if the older ones failed to die we would have no room for the newer material. We have come to regard our *Amaryllis* somewhat as an annual crop in that we plant large quantities of seed each year and each year a new crop of seedlings from several years previous planting comes into bloom.

We have had so many new seedlings to engage our attention that we have had no time to give to the maintenance or vegetative propagation of the better selections. We are constantly looking for virus free individuals for use in further breeding, and our attention is currently focused on one apparently virus free plant completely surrounded by virus infested material.

A. evansi appears to have good resistance, but we are in no position to make any statements about its absolute strength or heritability.

In one instance we tried heat inactivation of the virus by using a well established clone which had obvious symptoms but which had enough tolerance to be able to continue to grow and establish a large cluster of bulbs from offsets. We subjected individual bulbs from this clone to one half hourly increments of exposure to a temperature of 50 degrees Centigrade in a water bath and then planted the bulbs. Exposures of two and one half hours killed the bulbs but any lesser exposures which failed to kill the bulbs failed also to inactivate the virus.

As we close this account of some of our experiences with large scale outdoor production of *Amaryllis* from seed, may we express the hope that at least a few who may persist to the end will enjoy the reading of it as much as we have writing it. We have put a lot of hard work into what is supposed to be a hobby, but it has been a labor of love and we wouldn't have it otherwise.

THE AMARYLLIS CYCLE

W. J. PERRIN. *The Article Also Appeared In Men's Amaryllis Club Of New Orleans, Inc. News Letters, 1968-69.*

Most of us know what to do with certain plants but somehow don't know when to do and then there are some who know both and invariably skip the latter. We will attempt to go through the Amaryllis Cycle with hopes you will make allowances for the particular climate (temperature) in which you live.

Let's start the cycle in *Spring* at end of blooming season or at close of Spring Amaryllis Shows. Potted plants should be buried up to the rim in beds or some special location. Any moving or transplanting of bedded plants should be done at this time. Give half-day shade if possible. Start fertilizing program for both potted and bedded—this should run April through August. Don't use commercial fertilizer (powdered or granular); if you must, use it lightly and very low in nitrogen. Amaryllis roots are very tender and burn easily. Liquid fertilizer with a formula of 7-6-19 or near has proved more successful when used according to directions. This may be used twice monthly. Four feedings of commercial fertilizer may be used; one each month. Again be careful, it will burn roots especially if used with high nitrogen content. Bulbs should be planted eight inches apart in the ground. Potting may be done in seven inch clay pots. Make sure to put enough drainage material in bottom of the pot to prevent the pot from becoming water-logged. During the growing season two sprayings of Malathion Insecticide should be done in early Spring, then visible pests to watch are chewing caterpillars, slugs and snails. Chlorodane, snail and slug pellets usually overcome New Orleans pests. A lot depends on your locality; different insects have their special homing grounds. Water during this period should be generous, providing you have good drainage, and this drainage problem is a must.

This brings us up to the *Fall* season. Continue watering at a moderate rate through October or better until signs of first frost. Much depends on your locality, temperatures, etc. As soon as you note a potted plant which has shed all of its foliage stop all water and move this pot to winter rest location—it has gone to sleep for the winter. During October make preparations to protect bulbs against coming winter, always remembering it is possible to get a freeze in November. Bagasse or pine needles may be used to mulch. Bagasse (outer bark of sugar cane) is much neater for city gardens plus its decaying values make a good soil additive for the future. Outdoor plants will have to be given a good mulching well in advance of first freeze. Potted plants (in most cases, show prospects) must be moved to shelter at sign of first frost. Their location should be one free from direct sunlight with a temperature range of 35 to 55 degrees F. Care must be taken not to place pots in an area where temperature is subject to go below 32 degrees F.

A word about moving and transplanting. Many bulbs of other varieties are moved and planted in the fall months. The *Amaryllis* is best disturbed during the spring, the beginning of its growing cycle. Main disadvantage being when moved or planted in the fall months the root system does not have time to get established before freezing weather, ground is loose and consequently makes the bulb an ideal freezing prospect. Keep in mind *Amaryllis* bulbs are planted on the shallow side whereas many other bulbs are planted deeply. There is also no advantage in digging and storing bulbs during the winter months for resting purposes—this is done mostly in cases where the beds have to be worked over. Some grow clones in open beds then pot them as show prospects. Here we have a planting exception because the bulb is going to be protected and with thought in mind of bringing it into early or regulated bloom. Do this in October and when digging treat these as you would a tree. First wet or soak the soil then take bulb up with ball of soil attached and place it in pot, the whole idea being not to disturb the root system.

As we go into November all Amaryllis should be starting their rest period which is necessary for good spring bloom. Potted bulbs stored as show prospects should be given a treatment of Orthocide Garden Fungicide which contains 50% Captan or some similar fungicide. This is not hard to do. Use mixture as directed. With small paint brush, paint the exposed bulb from neck down with the solution, letting a generous amount saturate the extreme top of bulb. This will keep the scape from becoming scarred as the bulb blooms in the spring. We usually let pots in resting state November through February 15th. This year's show is more or less timed with outside bloom. Unless we have unusual weather outside bloom should be in progress by April 11 and 12. You may watch for buds in your garden beds before bringing potted bulbs out to light—this should be some time between February 15 and March 1st. Then start watering program with a light hand. Do this gradually, increasing as you note straps forming. The time will vary, depending on your location; in some cases as much as ten days. Those owning greenhouses will have to be doubly careful as this show is on the late side. If you push too quickly you may have a show all of your own by April 1st. Outside (bedded) plants require heavy mulching during the winter months and by all means good drainage. If in doubt about your drainage, then remove them to indoor location and replant in the spring. The question of water came up during our October meeting. Although we do not advise this you many occasionally let a small amount trickle down the pot edges, (during the resting period). This will help the root system keep fresh. Clay pots have a tendency to dry out rapidly, pulling all moisture away from soil.

You may also let active or evergreen foliage remain on your bulbs until it is burnt by frost or withers away in pots. We cut any remaining on January 1st. It will be interesting to note some hobbyists set pots on their sides during rest periods and let them dry out. As already mentioned, some type of fungicide should be used in solution or dusted as directed during rest period. When *timing for a certain date,* (in our case, April 12th), we usually guide ourselves by saying, ''buds should be peeping (showing) six weeks before show date.'' Now you can begin to see why February 15th is so important. By starting to concentrate on your bulbs February 15th you will have two weeks to start doing one of two things: (1) Start holding back those with buds showing; (2) Bring to light and heat the ones with no buds showing.

You should mark your calendar starting February 16th, *Number 8* then decrease the number marked each week until you reach April 6th. This will be marked *Number 1,* or one week from show date. This marked schedule will create interest you never dreamed of and will help you keep a weekly watch on the progress of bloom. Outside as well as inside temperatures will have much to do with bud and scape progress. Location also comes into the picture.

The most interesting part of the cycle is ''Timing the Bloom of the Amaryllis for a certain date.'' This takes patience, records and above all, attention. Summer care or what you have accomplished toward growing a healthy bulb will be in evidence during this period. Don't expect too much from the bulb which exerted itself the past year as a prize winner; this bulb may take one or two years to replenish itself especially if it has been forced drastically.

Assuming you have started a daily check starting February 15th (or six weeks prior to expected bloom, whatever your case may be), and have marked your calendar up to show date, the greater number of your bulbs should be showing buds on March 1st. Keep in mind heat control is very important now; some water, but not excessive. You may find water acting like alcohol to the automobile driver if too much is used. The bulb may do one of two things—either shrink or give out too much foliage. Let's mention again, protect your foliage—this is the food storer for next year's bloom. The neatest bloom will be found among the bulbs with activated root systems and scape preceding foliage. Late March warmth, coupled with the aid of greenhouse or indoor heat will enable you to time bloom very close. Some late forcing may be necessary but usually it is the opposite—we become too anxious and find ourselves with early bloom. Caution should be taken with newly purchased bulbs, remembering these came from foreign countries and have been forced (rested) in transit. Early bloom will prevail if these bulbs are given the same treatment as our native ones. Most of us have some show prospects planted outdoors; chances are these will not bloom in time or may be broken by the March winds. These may be potted and with proper heat are likely to turn out well. Some are late and will not show early. Let them take their time—forcing in this instance will cause shrinkage and damage to the bulb.

Some final tips and we will bring the article to a close. A little sun or strong sunlight is needed to give proper color value to blooms. Lowering of pots to bottom floor will help regulate and retard scape progress whereas elevation will speed up bloom. Pots should be *turned daily* to produce straight scapes. Don't be afraid to move pots from one location to another if bloom progress is too slow or fast; allow three days to note progress. Make notes for next year. Don't fertilize until show is over or blooming period has finished. If first scape arrives too fast there is always the possibility of a second. Water twice weekly, if needed, letting water penetrate entire pot. Keep soil moist, not damp.

It is hoped some parts of the cycle have been of some help to you. Much more can be said, however we must stick to basics as all localities have different environments. Last, don't miss the interesting experience, "TIMING AN AMARYLLIS BLOOM FOR A CERTAIN DATE."

VEGETATIVE REPRODUCTION AND INDUCTION OF POLYPLOIDY IN AMARYLLIS

RUSSELL H. MANNING, *Spring Valley, Minnesota 55975*

When it was read in Traub's THE AMARYLLIS MANUAL on pages 107-108 that no effective method to produce tetraploidy in the genus *Amaryllis* had yet been devised, this became a challenge to the writer. To date, this writer can not claim any concrete results but he has several methods which may well lead to the desired polyploidy in *Amaryllis*.

Several years ago, a gift bulb of an *Amaryllis* started to rot after trying to bloom without roots. In attempting to save the bulb from further shrinkage, it was placed upside down over a pint fruit jar which had several inches of water at the bottom. Some months later in spring, it was remembered and when checked, it was found to have set a large number of bulblets tightly around the exposed "bulbstem" and new roots had been generated inside where ordinarily they did not form. Why not use this same set-up for treating an *Amaryllis* bulb with colchicine? It was tried. There are outward signs of possible polyploidy having been introduced in that there are several changes in the leaves from the norm: coarser grained, rougher, rolling of some and variances among them. There are still 3 or 4 years yet of growth before bloomtime to note anything which may further lend credence to its having been effectively polyploidized.

A more detailed treatment given another bulb is as follows. Last Fall, 1968, before killing frosts hit, a large bulb was dug and the top leaves were cut to give about a 4″ neck. Next the roots were cut-off level with the bulb's base which was then hollowed-out with a paring knife to closely resemble the rotted bulb's condition. One should exercise care so as not to cut too far outward. The hollowed-out bulb was now placed up-side-down over a pint fruit jar with enough water at the bottom so that it came up several inches; and four toothpicks equally spaced were stuck into the side of the bulb to hold it so that there was ample airflow. Only about ½-inch of the green leaves was low enough to get into the water. Another toothpick was inserted into the pit of the hollowed-out portion of the bulb to destroy the growing point. Then a weak mixture of colchicine (.2 colchicine reduced down again with about 5 parts well water), gibbrellic acid, rootone, and a fungicide were put into the pit in the bulb. Then a cap which loosely fit over the cut portion to keep sunlight out was made of aluminum kitchen foil. This held its shape and could easily be removed for inspection during the winter. During midwinter the leaves ripened-off, then towards spring bulb shrinkage started because regeneration of tissues had started. All signs of dead tissues were removed except the leaves which were needed to steady the bulb on the 4 toothpicks. When small bulblets could be faintly discerned and ''upswellings'' as reticulations inside the hollowed-out base came to a standstill as to further development, the bulb was set in a 3″ pot upside-down on top of the soil and lightly watered. As a word of caution, try not to get any moisture down inside the bulb scales as it accelerates the rot which will form. All rot was removed as seen and also all the dried portions of the scales were also removed to get sunlight onto the green portions of the bulb scales. The largest bulblet (by far) failed to develop a green leaf; some of the smallest ones which were in the area in which the knife had cut through, set so many little bulbs that they almost touched one another; but only two developed of these. Altogether seven ramets are growing of this bulb and two things are true of them all: they started developing a green leaf soon and also grew roots of their own, but those that did not, died by drying-up.

For this Fall, Dr. Traub's article: COLCHICINE INDUCED HEMEROCALLIS POLYPLOIDS in 1951 PLANT LIFE, pp. 83-116 has given the writer a sharpened tool, possibly, in the REPEATED USE of the mild colchicine solution. So, instead of filling the cavity once, it will be filled several times. Further the leaves will not be immersed into the water but rather the bulb scales may get their moisture from the solution. So now, another year of anticipation is ahead and further results may follow.

ADDENDUM

Possibly a word of caution should be added in the use of the chemical, colchicine, as it may cause cancer to the human body if not washed-off with hot water and soap immediately.

Again, others may desire to try this method for propagating a favored clone as it does not require special equipment to do so. The controls in the experiments will provide replacements for the bulbs which have been used in colchicine treatments and also may provide a clue as to whether the gibbrellic acid and rootone will further increase the number of ramets from each bulb as these will be added each time when the colchicine solution is applied to the experimental bulbs. This will be needful as Amaryllis are sensitive plants and possibly too much of the gibbrellic acid and rootone can be as inhibitive as too much colchicine itself. Further as the writer had no surplus Amaryllis bulbs, he used large onions to gain a better skill in coring out the cavity in the bulbs' bases several years ago; others may wish to improve their skill on an onion or two before cutting a core in an Amaryllis bulb which may hold high sentimental value as well as financial value.

1968-1969 FLORIDA AMARYLLIS SEASON

Mrs. Fred Tebben,
Box 12, Lake Hamilton, Florida 22 33851

When I returned to Florida in the fall of 1968, I found all my *Amaryllis* had lost their leaves and were dormant. I do not know whether this was due to lack of rain, or to ravages of the Lubber Grasshopper. We had a few good rains in October so the *Amaryllis* put up new leaves and all looked in fine condition. However, our winter began on Nov. 9 with our first frost, very early indeed. From then on we have cold weather, not extremely cold but hovering between 30 and 50 degrees F., most of the time.

Before Christmas we had our one killing frost which took all our Poinsettias and other tropical things. Cold weather continued and I had white frost on the lawn 13 times from November until the end of March. Most of the *Amaryllis* retained their foliage as they are planted in protected places, but the blooming season was late and very unsatisfactory. Only about one-fourth of my bulbs bloomed; with only one scape per bulb and having two florets per umbel. I noted too, that the *Crinum* and Daylily bloom was very sparse, a large clump of each having only one scape of bloom, and many showing no bloom at all.

There is no loss without some small gain—we found that there were very few lubber grasshoppers. Too cold at the time they should have emerged from the ground, I suppose. The saying is that one extreme follows another, so Florida had the hottest June and July in many, many years. The rains came, however, and everything remained green and lovely. I noted that due to the cold, many bulbs had lost their roots and were just beginning to put out new ones when I left Florida in late July. Those that retained their roots and foliage were fertilized well with a phosphate and potash mixture. First application was a 6-6-6, a favorite fertilizer for almost everything in Florida, except azaleas and camellias. When I return in the fall, I shall make one more application of this same mixture, and will hope for better bloom another season.

I have been most pleased to see the hardier Dutch bulbs are forming clumps, but I am sure I have lost many of the more delicate ones that cannot stand outdoor temperatures.

FIRST YEAR HOBBY GREENHOUSE

William R. Adee, *916 Sunset Av.,
Waukegan, Illinois 60085*

I am completing my first year of raising amaryllids in a small hobby greenhouse. Outgrowing it has been the first major problem. Friends, generous with seeds and plants, have left me overflowing with pots onto the patio. I expected everything to grow better in a greenhouse but such is not always the case. *Amaryllis reticulata* grows grudgingly. *A. reticulata striatafolia* has been with me since November 1967 and has yet to grow a leaf. Occasionally the bulb glows greener. I suspect this branch of the family is among the most difficult, yet *A. blumenavia* grew, blossomed in June 1969, and set two fat pods when selfed. It prospers in a six inch pot of soggy soil in a shaded area of the greenhouse floor.

As a collector, I am a beginner. My first plants were a pot of seedlings found in a nursery in Glendale, California labeled ''probable *Amaryllis striata fulgida*''. I think some of them were *A. striata fulgida* but some of the bulbs were larger in leaf and bulb with large red-orange flowers. The smaller bulbs produced smaller orange flowers. The red-orange flower is handsome with irregular form, two flowers to the scape, and none set seed pods. Vigorous seedlings have been produced from pollen used on 'Zenith', and pink Howard & Smith clones, 'Chadwick', white, (Orange Queen x Scavias Orange), and 'Carousel'.

Mr. Richard Sudd sent seed of rare *Amaryllis* in the spring of 1969, among them, *A. calyptrata.* Several of these germinated in fifteen days and have prospered in the conditions I maintain in the greenhouse. The aulicas prosper in the warm, dry condition. I like the pots to dry out quickly after each hand watering.

I have found the newly received bulbs to be touchy in their requirements, but have received so many in these few years that I like to believe I have found a few answers to some of the problems. I use a commercial soil, Baccto, for everything. I suspect this material has more absorbent quality and less sand than most of you would recommend but it works for me under my conditions. Newly received bulbs spend a month or more in a cool, dry basement under fluorescent lights before finding their niche in the greenhouse. I never water new plants at all until I see evidence of growth and I am sure root growth has begun; then water must be applied sparingly. I have lost very few plants out of hundreds of small seedlings, difficult and rare species, and hybrids received.

A. striata acuminata, and *crocata, A. belladonna plena,* and some other *A. belladonna* specimens are exceedingly difficult for me. I hope to eventually meet their requirements more fully and with this goal in mind I keep careful records of growth patterns, periods of even slight rest, dormancy, and hopefully, blossom time. Bulbs newly received from South America will sometimes indicate a need for rest by reacting to watering by producing pale green growth that tends to topple over of its own weight. These are dried off, withdrawn from the greenhouse, and placed in the basement until they show signs of wanting to grow again.

I make a file card record of each plant as I receive it. I also give it an aluminum tag with a stamped number. The metal stamps are available in most hardware stores, as are easy-to-cut aluminum sheets for tags.

I keep a log book of attempted pollinations. I record the pollinations, successful or not, on the file card of the pod parent. I think it is important to know which pollens have been accepted as well as which have been rejected.

I am grateful to Mr. Alek Korsakoff, Mr. Roger Fesmire, Mr. Doran, and Mr. Paul H. Williams, Jr. for rare pollen. Mr. Williams sent pollen of *A. elegans* ''albostriata'' which blossomed in June 1968. I kept some for myself and sent some on to Mrs. Flores Foster of Long Beach, California to use on her extensive collection. She has made some fine crosses involving her Dutch hybrids and species.

Mr. Williams also sent pollen of *A. angustifolia* which was used on several specie hybrids. From the picture he sent of it, it must be magnificent.

I have been able to keep pollen in the refrigerator with the aid of a desiccator capsule from my children's vitamin pill jar.

One very special *A. belladonna* x *A. striata* of recurring blossom habit, lovely rose-red color and miniature size has finally set seed that have germinated. On first blossoming no seeds were set, but each succeeding attempted pollination has produced a larger yield of seeds, and the most recent yield germinated. The plant was bought from Mrs. Korsakoff. The pollens used included fourteen different pollens, seven on each blossom, some from Mr. Doran, some from my own plants, and *A. angustifolia* from Mr. Williams. I do not approve of mixed pollen, but from this pod parent I am happy to have seedlings of any pollen parent.

A handsome, recurrent blooming ''Senorita'' also set seed for the first time after many previous attempts had failed. Mr. Orville Fay, the talented iris and hemerocallis breeder, once told me that sometimes near-sterile plants will begin to produce seed and will become increasingly productive of seed if enough attempts at pollinating are made. He was speaking of iris or hemerocallis at the time, but I feel his theory might be true of amaryllis.

The plants I received from Dr. Ruppel have prospered but have not bloomed. Seed of *A. immaculata* and *A. yanellosianum* germinated almost 100 per cent. They are vigorous growing but the *A. immaculata* has a short dormancy after first leaves come. *A. belladonna* ''minor'' seedlings, delicate and fragile in their first year, grow better during their second growing season. Dr. Ruppel's *A.* ''brown'' from Sao Leopold is a handsome and vigorous species. *A. flammigera* is seemingly easy in pot culture. *A.* ''itatiaia'' makes a beautiful plant with long, narrow, pointed leaves, an easy pot plant. ''A. Mrs. Sosa'' *(A. viridiflora)* has glaucous, short beautiful green leaves, although the short leaf may not be typical growth. The *Amaryllis* he calls ''orange Reitz'' is an attractive miniature with unbelievably strong root growth and many offsets. It is reported to be a pale orange pink, two flowers on a tall scape. Dr. Ruppel set pods on this plant with pollen of *A. apertispatha* indicating maybe that it is a polyploid. The seed that germinated did not produce strong seedlings.

Dr. Elizabeth Naundorff, Box 3073, Quito, Ecuador has been a source of some interesting amaryllids this spring. Her primary interest is bromelliads but on her collecting trips she has been kind enough to watch for amaryllids for me. She has sent *Stenomesson aurantiacum,* a pink *Callipsyche,* and *Bomarea subspicata.* Several bulbs blossomed soon after receipt and look like the pictures of *Phaedranassa* in the 1969 Yearbook. The flower had a coral tube and apple green segments. She also sent a sample of what may prove to be an *Agapanthus* she found growing near a ranch garden.

A large bulb of *Paramongaia weberbauri* was acquired this year and is a prized possession. It has just become dormant in mid July.

In addition to the *Stenomesson aurantiacum,* I was fortunate to receive bulbs of *Stenomesson variegatum.* These have pretty foliage and did not seem harmed by their transfer to Illinois.

My *Cyrtanthus* collection continues to grow and they occasionally flower. Some pollinations have succeeded and seedlings are growing. Mr. Korsakoff's lovely hybrid, ''Marusia'' blossomed in March. The clone ''William Henry'' is the largest one to flower to date. It opened a burnt-orange, matured to orange, and aged to pink.

Hieronymiella aurea is resting leafless this summer. It appears to resent heat. It is reputed to be cold resistant, but I am afraid to plant it outdoors.

I am trying a few nerines in pots. They are dormant this summer except for two that wanted to grow leaves. *Nerine undulata* blossomed in Nov. 1968 soon after receipt. It refused pollen of *N. filamentosa* which is a similar size.

I am grateful to generous friends for seedlings of the following species hybrids: *A. aulica* x *forgeti, A. aulica* x *pardina, A. evansiae* x *yungacensis, A. forgeti* x *yungacensis, A. reginae* x *evansiae, A. reginae* x *starkii, A. starkii* x *evansiae, A. evansiae* x *A. pardina, A. pardina* x *ambigua, A. angustifolia* x *ambigua,* and *A. yungacensis* x *johnsonii.*

This hobby has been exciting, educational, and rewarding because of the charming people with whom I have corresponded, the constant surprise and pleasure of watching the combinations of germ plasm produce their rewards.

EXPERIENCES WITH AMARYLLIDS

Hugh L. Bush, *109 East 33rd Street,*
Kansas City, Missouri 64111

A native South Carolinian accustomed to gardening in the sandy loam of the southeastern coastal region could have no possible idea of the problems to be encountered in gardening in the ''Midway—USA'' area, but I quickly found out when I moved to St. Louis in the fall of 1968 and then on to a permanent location in Kansas City, Missouri, in the early spring of 1969.

Heavy cold rains, temperatures ranging to –5°F., fierce winds and a heavy clayey-muck gumbo type soil, however, are not too discouraging to one as interested in gardening in general and growing hybrid *Amaryllis* and *Amaryllis species* as is this writer.

Large beds were spaded up and generous amounts of well rotted leaf mold, rotted cow manure by the truck load, and sand were worked in; these to receive the *Hemerocallis, Iris,* and *Lycoris,* which were readily available from various nurseries.

Not so, with *Amaryllis species,* however. They are not too easily obtained. Having had an intense interest in *Amaryllis species* and hybrids since many years ago when I pollinated a bloom on one of my mother's *Amaryllis belladonna* with pollen from a beautiful Dutch hybrid obtained from the late Cecil Houdyshel, and observing the results, I decided then and there at that early age that *Amaryllis* would always be one of the main interests of my life. I know of no other plant family that offers so much beauty and variety as that of the family *Amaryllidaceae.*

Having twice lost my entire *Amaryllis* collection due to one type of holocaust or another, plans were rapidly made to grow *Amaryllis* inside the house under fluorescent ''Gro-Lux'' lamps as I have had previous remarkable success with this method. ''Distress signals'' were sent out to many of my friend *Amaryllidarians* and the response was overwhelming.

As this is written in early August, 1969, approximately sixty pots of small bulbs of *Amaryllis* species and hybrids of them, twenty-five pots full of *Amaryllis* seedlings growing from seed planted earlier, seedlings of *Worsleya rayneri,* various *Cyrtanthus* hybrids, and *Eucharis* are growing nicely under fluorescent lights. In addition, several different varieties and species of *Agapanthus, Crinums, Crinodonna, Hymenocallis, Alliums,* and *Haemanthus* are growing in pots on the patio where they receive the morning sun, and eight large *Clivias* are growing in the filtered light of a large maple tree. Twenty or more *Habranthus* and *Zephyranthes* are growing in four-inch pots in full sun.

As in the past, I shall continue to grow the *Amaryllidaceae* and send pollen, seed and offsets as available to friends in all parts of the world, for I have found my previous efforts in this respect amply rewarded.

And my digging and spading efforts here have been amply rewarded too, as I have enjoyed many fine blooms of the *Hemerocallis* and *Iris.*

After 10.39 inches of rainfall during the month of July, I am now enjoying the beautiful blooms of *Lycoris squamigera* (see Fig. 31) which have sprung up overnight as if by magic.

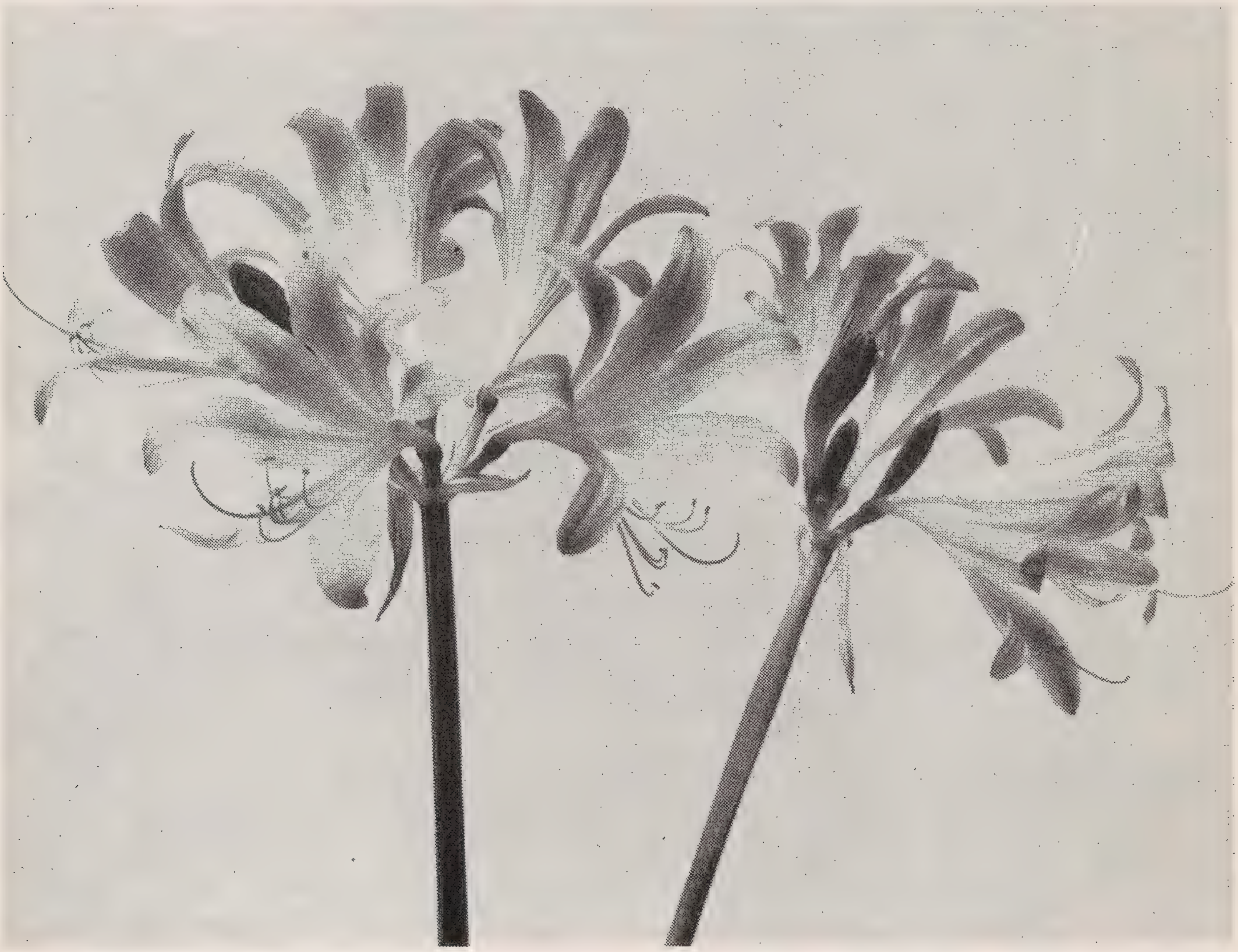

Fig. 31. *Lycoris squamigera* as grown by Hugh L. Bush in Kansas City, Missouri. Photo by Hugh L. Bush.

AMARYLLIS CULTURE IN NORTHERN ILLINOIS

William R. Adee,
916 Sunset Ave., Waukegan, Illinois 60085

In the summer of 1968 I bought an aluminum, glass-to-ground, twelve foot by four foot, lean-to greenhouse. I erected it on the east side of an attached garage where it receives morning and early afternoon sun and is protected on its three glass sides by a six foot patio fence. The floor is of sand with cement patio blocks for the aisle. The floor of the bench is covered with one-half inch hardware cloth that permits air circulation, moisture to rise from the dampened sand floor, and sunlight to filter through the pots to the seedlings and *Clivia* on the floor under the benches.

Heat is provided by a thermostatically controlled, natural gas heater that draws its air supply from outside the greenhouse, heats it, and redistributes it by fan. Too much heat is also controlled by a thermostat that activates a cooling fan removing stale air and replacing it with fresh. The cooling fan does dry out pots that have been too generously watered so it serves a double purpose.

I began to feel the need for a greenhouse when my plant collection outgrew the fluorescent light set-up in the basement. *Amaryllis* grow beautiful leaves under fluorescent lights and seem to enjoy the unvarying temperature and controlled moisture and feeding that can be given with this culture. I still use it for newly received, newly transplanted, sickly, and seedling plants. When new strong growth begins they go into the greenhouse.

Summer heat in the greenhouse is too much, even with fans and shading, for delicate, newly transplanted, and seedling bulbs. I lost several fine, newly acquired bulbs before learning this lesson. Five months later some of these damaged plants have still not recovered.

Seeds, however, start germination beautifully in the strong heat of a summer greenhouse, but they should be moved to cooler quarters to be grown on.

I have electricity in the greenhouse but have to carry water from a short distance. I keep a mixture of nitrogen, phosphorus, and potash in water in a squeeze type detergent bottle, adding a bit of this strong solution to each batch of water. Sudbury sells these elements in separate container which permits me to make my own combination. Trace elements are added in very small quantities about twice a year.

I use four inch clay pots for most bulbs and a commercial potting soil. The holes in the pots are easily enlarged with a chisel and hammer, covered with chips of broken pot, and filled one and one-half inch with poultry oyster chips.

I use a systemic poison on the plants every six or seven weeks, but wonder if the dry fertilizer with which it is mixed isn't too strong. Time will tell.

GOALS

In hybridizing with species amaryllis I am looking for orchid, double, and trumpet forms and new colors. Leaf growth seems to be too large in some miniatures. I am trying to produce some smaller ones about the size of ''Mrs. Garfield''.

Northern Illinois gardeners dig *Sprekelia* each fall and replant in open ground in the spring with immediate blossoms. I have read that *Amaryllis elegans* types can be handled in this manner and want to experiment along these lines. With this in mind I have imported from Argentina two *A. elegans* types, but have been unable to find *A. elegans ambigua* or *A. elegans immaculata.*

OBTAINING AMARYLLIS SPECIES

Amaryllis hobbyists have been more than generous in sharing offsets, pollen, seedlings and seeds. Possible sources of plant material are people who write articles such as this, people who register *Amaryllis*, *Amaryllis* and other tropical plant collectors in South America. Always include self addressed, stamped envelopes when writing, and offer to pay postage costs if answers are expected.

My collection includes *A. agliae, A. argilagae,* several *A. aulica* types, *A. belladonna plena, A. b. reflexa, A. b. minor, A. b. major, A. blumenavia,* a brown species from Sao Leopold, *A. Correiensis, A. cybister, A. elegans albostriata, A. e. viridiflora, A.* ''equestris'' pleno, *A. espiritensis, A. evansiae, A. flammigera, itatiaia, A. moreliana,* ''orange Reitz'' (a dwarf omphalissa from Brazil), *A. pardina, A. psittacina, A.* ''red Cochuna'', *A. reginae, A. reticulata* var. *reticulata,* r. *striatafolia, A.* a dwarf from Sierra Chapada, Brazil, *A.* starkii, several forms of *A. striata, A. vittata tweediana,* and *A.* ''yanellosianum.'' I started the collection in December 1967.

OTHER AMARYLLIDS

My collection also includes *Cyrtanthus, Zephyranthes, Hymenocallis, Urceolina, Nerine,* and *Clivia.* Newly received are seeds of *Clivia* ''Red Jasper'' and an amaryllid, ''yellow, many flowered, fragrant, and cold resistant,'' both from Argentina. The *Clivia* has been described in glowing terms by Dr. Ruppel who says it is from two undistinguished parents. Seeds of *Alstroemeria* x *orpetiae* from Dr. Traub have germinated and are growing nicely.

More northerners should raise *Clivia.* It is such an undemanding plant and blossoms in December. Constant moisture is easily supplied by plastic pots and very little light is required.

SUMMER FLOWERING AMARYLLIS

Four *Amaryllis* blossomed in the summer of 1968. Among them was a *haywardii* x *striata* hybrid that is very vigorous, has a beautiful pink flower, recurrent flowering habit and so far has been quite sterile; but it did set one pod with pollen of white Dutch x calyptrata sent to me by a friend in California. There were only two seeds in the pod. They have been planted and I am waiting and hoping.

VEGETATIVE PROPAGATION OF HYMENOCALLIS LONGIPETALA

CARLOS G. RUPPEL, *Box 370, Mendoza, Argentina*

Seven or eight years ago I saw an advertisement about an ''improved Peruvian Lily'', named Elisena Longipetala, now, *Hymenocallis longipetala.* After a while I had at home a strong bulb of it purchased to an American dealer.

It bloomed at home in early summer. The beauty and perfume of the flower surprised everybody. It really was a better form than *Ismene* spp., I had successfully grown in my garden, for years.

After several years culture, I am sure *H. longipetala* is a reliable garden plant for the border, deciduous in my area, of easy culture, needs hybrid Amaryllis-like treatment. But it is a slow increaser in Mendoza. After many years, I have a strong clump of 8 bulbs.

So, on September 21, 1963 (beginning of spring) I decided to multiply it. I took *one* strong bulb and cut it into pieces. After disinfecting with a weak solution of ''Zineb'' and treatment with a rooting hormone I placed cuttings into pure sand, one-inch deep in four 6″ pots, covered with polyethylene bag and took them to a semi-shady spot.

Cuttings were distributed as follows:

Pot No. 1	8	strong rooted cuttings.
Pot No. 2	18	thick central rootless cuttings.
Pot No. 3	13	thinner central cuttings.
Pot No. 4	14	smaller central cuttings.
TOTAL	53	cuttings.

At the beginning of summer several sprouts were showing and from then on, new offsets have been produced.

Pot No. 1, has been left to dry off and 10 bulbs are resting. Pots No. 2, 3, and 4 are watered to date, in order to compare results between dormant and vegetating bulbs. All three pots have sturdy vegetating plants.

Results on July 24th, '64 that is at the beginning of winter:

Pot No. 1 contains 10 Plants	125,00%	Success.
Pot No. 2 contains 22 Plants	122,22%	Success.
Pot No. 3 contains 13 Plants	100,00%	Success.
Pot No. 4 contains 11 Plants	78,57%	Success.

General results: 53 cuttings, have produced 56 healthy plants first season, that is 105,66% success, which can be considered quite satisfactory.

THE "AMBOINA CHALICE LILY," EURYCLES AMBOINENSIS

Alek Korsakoff, *7634 Oriole Street,*
Jacksonville, Florida 32208

Well, here is a plant in the Amaryllis Family resembling no other amaryllid so far as I have seen, excepting its kin, *Eurycles cunninghamii,* a hardier relative (see Fig. 32).

Eurycles amboinensis (L.) Lindl. is commonly known as ''Brisbane Lily'' or ''Amboina Chalice Lily''. I obtained it in March 1959 from an elderly lady in Miami under the name, ''Nassau Lily'', who said that she had received it from her daughter living in the Bahamas.

On one of my walks, I spied this unusual plant in the lady's yard and knew at once I had to have it at any cost. Before I realized it, I was ringing the door bell. . . . After I had promised to bring a dozen "Rain Lily" bulbs, especially the yellow ones, I had in my possession a plant that even now, after 10 years of growing it, I would not part with; even if it was the only plant I could keep.

At home, my newly acquired baby was potted and was watched like no other plant before or since. Very soon it pushed out another leaf

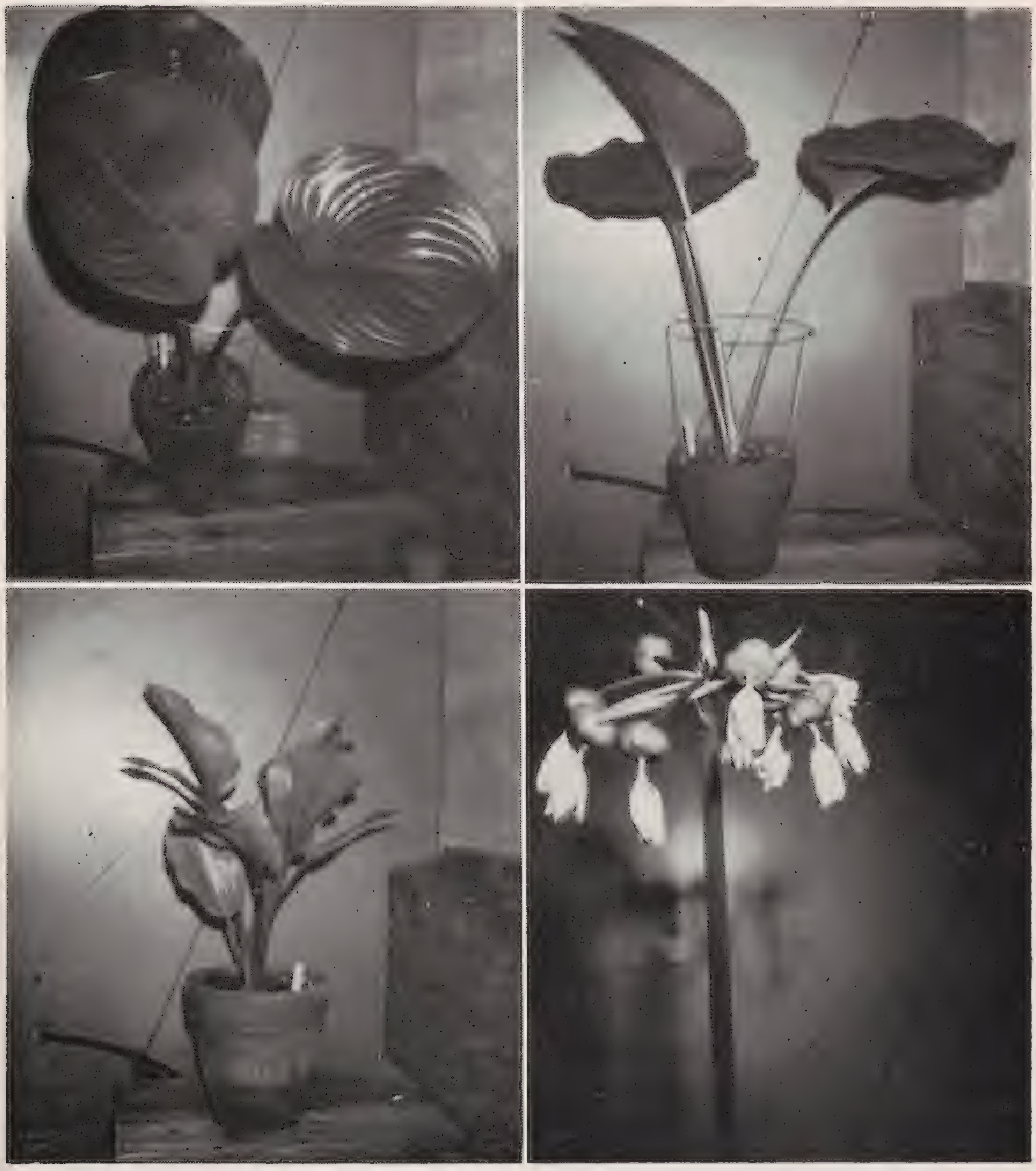

Fig. 32. Upper left, *Eurycles amboinensis,* in a 5-inch pot, top view. Upper right, the same plant, side view. Lower left, *Eurycles cunninghamii,* in 7-inch pot. Lower right, Ripening fruit of *E. cunninghamii.* Photos by Alek Korsaoff, 7-21-69.

and I knew it was all right. With the coming of autumn, it went to sleep.

None of Floragoof friends knew the plant; none of the nurserymen contacted could tell what it was and how to care for it. I simply had to watch and improvise. Then, the 1961 PLANT LIFE came, and there was my darling—*Eurycles amboinensis*—foliage and flowers. (See PLANT LIFE 17: 38—40. 1961). In June of 1962 my plant bloomed.

While in Miami, it was grown in the half shade slathouse and developed the best in 10″ pots. I still can visualize these lovely vigorous clumps. Here in the greenhouse, I keep it as single bulb specimens in 5″ and 6″ pots and probably enjoy it more in detail.

During the 10 years, I found, or think I did, that it grows best in a rich gritty mixture that drains well. It is fed once in a while during the active growth phase with anything that is handy and in lower concentrations than recommended.

In Miami some winters it stayed evergreen; some winters it was dormant for two to three months. Here it gradually loses foliage late in December or January and rests until early May, about the same as my *Haemanthus multiflorus* does. When the last leaf starts changing color, I stop watering and expose about 2/3 of the bulb so that, when it gets monthly watering during dormancy, no water gets in the deep depression in the top of the bulb—the last drying leaf leaves a hole in the top, which I fill with a little ''Fermate.''

With the coming of spring, I hover over the pots of my beloved ''Amboina Chalice Lilies'', watching for the sign of the green in the dark hole in the top of the bulb. As soon as I see the tip of the new leaf, I give the soil in the pot a good soaking and fill the pot with new soil within about an inch of the top. Every two years, I remove the offsets, if any, and repot.

The temperature in winter on the greenhouse benches so far never dropped below 52° F. In summer, the temperature in the greenhouse rises to 110—112° F. on the hottest days of 98—100° outside.

If I had to choose, and I could keep only one plant, *Eurycles amboinensis,* the ''Amboina Chalice Lily'' would be it.

EURYCLES AMBOINENSIS

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For many years the beautiful *Eurycles amboinensis* (L.) Lindl., the ''Amboina Chalice Lily,'' was nearly unobtainable. It was recognized by Linnaeus as *Pancratium amboinense* L. (1753). In 1965 the writer entered into correspondence with a Miss Emory, a very gracious lady of the Saba Islands, who offered to share bulbs of her *Amaryllis* with those who bought of her beautiful needlework. And indeed, it is beautiful.

This information was passed along to my *Amaryllis* friend, Mrs.

Flores Foster of Long Beach, California, whom I had earlier interested in *Amaryllis* species. In the purchasing of Miss Emory's beautiful needlework and subsequent receipt of bulbs, Mrs. Foster received several bulbs which Miss Emory had labeled "White Lily". Two of the bulbs were sent to me and they were determined to be *Eurycles.* The foliage, when examined, led me to believe this was the long last *Eurycles amboinensis* (L.) Lindl., and later the blooms facilitated definite determination. (See also PLANT LIFE 17: 38-40. 1961.)

Bulbs and seed of this beautiful *Amaryllid* have been distributed and now at least one *Amaryllis* enthusiast offers *Eurycles amboinensis* (L.) Lindl. on a commercial basis.

DAYLILY REPORT—1969

W. Quinn Buck, *Daylily Committee,*
American Plant Life Society

The 1969 season was marked by unfavorable weather, temperatures, or moisture in many parts of the South, while the Midwest had fine rains, with resultant good bloom. The overcast weather of June in the writer's area was more prolonged than usual, but in general temperatures were somewhat more favorable for both performance and for seed set.

The really remarkable development this year was the progress in the breeding of lavenders and purples in a number of important gardens. One enthusiastic breeder of tetraploids has reported that in Georgia, Frank Child's lavender diploid seedlings in 1969 far outshone his block of some 2000 tetraploid seedlings blooming for the first time. In Chicago James E. Marsh numbered almost forty new tetraploid lavender and purple seedlings, and Orville W. Fay flowered some magnificent new diploid seedlings derived from 'Lavender Parade' and 'Beautiful Lady' lines. In my own California garden some fine lavenders and purples continue to appear in crosses of 'Lavender Parade' (Fay) with 'Blue Jay' and 'Lavender Flight' (Spalding), and among treated plants used in my breeding work in 1969 were 'Little Wart', 'Lavender Flight', and 'Wannetta' (Spalding); 'Lavender Parade' (Fay); ''Primavera' (Wynne); and D65-78 ('Lavender Parade' x 'Blue Jay') and 64-37 ('Breaking Dawn' x 'Lavender Parade'), both from Steve Moldovan, and both of outstandingly clear lavender-purple color.

Mr. Marsh expects to introduce his lavender T69-25, probably the most admired of his many new tetraploid seedlings in this color. He also flowered a particularly good new red tetraploid, T69-50, which will be released. Mr. Marsh's 'Prairie Moonlight' won the President's Cup at the American Hemerocallis Society Convention for 1969 because of its superb clump effect; this variety has been most outstanding in my California garden for the last two seasons.

Hubert L. Fischer had many new seedlings, including tetraploids, in his Hinsdale garden. Two outstanding new things were his light red

'Red Spinel', and darker wine red 'Oriental Ruby', both diploids not yet introduced.

In the Nathan Rudolph garden in Aurora many new yellow and pink tetraploid seedlings were flowered this year. Visitors found his tetraploid 'Yellow Champagne' and diploid 'Coral Lace' very good and most attractive.

In the Fay garden in Northbrook, Ill., in addition to the new diploids already mentioned, there were many fine new yellow, pink, and lavender tetraploids. Visitors especially liked the pink 'Twilight Sky' and 'Shell Pink', and melon 'Dark Copper' and 'Lynn Markham'.

Bro. Charles Reckamp had another amazing year with his hundreds of fine tetraploid melon seedlings at Mission Gardens. His beautifully ruffled 'Magic Wand', and 'Samoa' were the favorites of garden visitors.

One correspondent reports that the 1969 A. H. S. Convention in Austin and Albert Lea, Minn., had two very outstanding new varieties, 'Alpine Air' and 'Mildred Krueger', both from Minks Gardens.

Dr. Peck this year flowered a remarkable new line of yellows out of two induced seedlings, crossed with her 'Bonnie John Seton'. These yellows begin opening about noon and remain in good condition until almost noon of the second day thereafter. Her most outstanding new red this year was seedling T2-71-69 (T2-1-66 x 'Bonnie John Seton'), representing a group of 1967 crosses of dark red x wide-petaled yellows. This very large red seedling seemed to have every good quality, including being sunproof. Dr. Peck also bloomed a most interesting new line of rose-red pinks. Her seedling T2-125-69 proved to be an exceptionally good breeder and is one of her best new lavenders. Seedling T2-141-69 was "a wide-petaled cream with rose brushing and very crimped deep pie crust gold edging"—and completely sunfast.

Some of the new varieties evaluated by correspondents included 'Catherine Woodberry' (Childs), 'Silver Shadows' (Munson), both superlative lavenders; 'Ice Carnival' (Childs), considered the best of the whites by some; and the late David Hall's apricot 'My Kind', pink 'Family Party', and especially the magnificent pink 'Master Touch', all of which have been reported most favorably from over the country.

In my own garden this year the most beautiful of the new diploids grown were 'Fabula' (Wild-Hardy), a rounded creamy pink, 'Orient' (Wynne), bright salmon peach with dark eye, and '23d Psalm' (MacMillan), a ruffled flat pink with darker pink eyezone. Two very satisfactory new tetraploids were 'Seed Setter' (Hardy), and 'Adela' (Griesbach), both melons. 'Northbrook Star' (Fay) was a spectacular big light yellow, and 'California Butterfly' (Traub) was a massive yellow of great beauty. Very fine performances were given by 'Mary Todd' (Fay), one of the best yellows available; velvety red 'Sir Patrick Spens' (Peck); pinks 'Bonnie Barbara Allen', 'Fair Annet', and 'Queen Eleanor' (Peck). Treated plants of great promise as parents included 'Vivacious' (Munson), a bright, glowing rose; 'Toyland' (Bro. Charles Reckamp), apricot melon miniature; 'Little Rainbow' (Bro. Charles), a lovely small melon; 'Marguerite Lloyd' (Lloyd), large eyed yellow;

'William Munson' (MacMillan), huge melon; 'Louise Russell' (Fay), superbly branched rose; 'Fashion Model' (Lester), one of the finest melons; 'Cloth of Gold' (Wynne), gold with extraordinary substance and beautiful ruffling; and 'Annie Welch' (Claar), made far more beautiful by the treatment with colchicine.

It was a good year for all of us daylily growers, in spite of weather and other hindrances.

AMARYLLIS SEASON, 1969

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Over a number of years I have been accumulating a large collection of *Amaryllis* hybrids and species. I have dreamed of retiring and having that leisure time I desired to work with these plants. I felt I could develop a strain of *Amaryllis* much easier to cultivate both as pot plants and as garden subjects here in the south. I am quite sure these improvements would greatly enhance the commercial value of this spectacular flowering plant.

In preparing for my retirement I developed an *Amaryllis* import business. I felt this would supply that little extra cash I would need after I retired to pursue my interest in *Amaryllis* as well as other things I had longed to do.

Since retiring last year neither the extra time nor the extra cash has developed. As the business grew so did its problems and the more time it consumed the less profit it made. I found I was spending untold hours at chores and details that deprived me of the enjoyment I had once received from my hobby when the business was only a small part of it. I have found, as others before me, that the amaryllis bulb business has inherent difficulties built into it that doom one to failure. The larger that business gets the more risk one has to take. Eventually the risks become so great that the probability of failure is certain.

The Amaryllis Import business is very fascinating and has been an interesting experience. I am quite sure the problems in it fascinated me as much as anything. I still do not want to admit I could not lick these problems; however no one whom I know of has been successful in building an exclusive amaryllis business. The problems are enormous and the product is not sufficiently reliable to promote commercial confidence in the product. This results in complaints from customers which is a mental and physical strain as well as a financial one in trying to satisfy them. One can not do all things and eventually what started out as fun turns into a nightmare.

I am now a littler older than when I started (but then not too much older), a little poorer (but not broke), exhausted but I hope somewhat wiser. I have learned among other things that one should not try to turn a hobby into a business for if you do it will become a burden and any mention of the subject will mean work rather than pleasure. This is about the state I find myself in today.

I do not plan to discard the business but I do plan to reduce it and return it to the hobby it started out to be. I have found much enjoyment working with my amaryllis and meeting many real and most interesting people and friends. I feel sure my interest in amaryllis will greatly increase again as my chores are reduced. So at this time, still with some difficulty, I turn to set down some impressions of the past season and pass on some information that may be of interest to amaryllis fanciers.

The past two winters in Florida have been mild. Outdoor planting of amaryllis as a result of this have flowered much better than in previous seasons. Even with the better flowering season interest in amaryllis is not as great as it has been in past seasons. The demand for new imported bulbs slowed down and many were unsold at the end of the season. Most customers indicated that they experienced cultural difficulties. Some say that newly imported bulbs were in poor condition and failed to respond. Waterfront strikes during the past several years have made importing difficulties and delays have occurred in delivery. This has no doubt had an adverse effect on the performance of newly imported bulbs but this is not the only problem nor the greatest problem. There is an undercurrent that persists in most complaints. This is that many fans experience cultural failure. They can not carry over their bulbs to flower year after year. Two things are needed badly; More cultural information and more suitable varieties for potting as well as border culture. I doubt that much progress is being made in this direction. Most Dutch varieties are greenhouse grown where requirements in cultivation can be met more exactly than can be provided by fans. The Dutch amaryllis are grown more for winter forcing and are not particularly adaptable to the average pot or border conditions provided by the fancier. There is not enough commercial nor private interest in amaryllis in this country to economically support research in the culture of the plant. This is a pity for without such research great improvements in cultural practice or the development of more vigorous hybrids will be slow. Fanciers have to accept this. He must accept the fact that many varieties he buys will only give a good showing the first season.

The fan himself is partly responsible for this condition as most have sought improvement in size and color of flower rather than vigor in plants. Before much improvement is made the fancier will have to demand vigor in the plant possibly at some sacrifice in flower size and color at least to start with. The fan can help himself by growing seedlings of crosses on plants that seem most adaptable to his particular area. Like English gardeners do, hobbyists should develop their own strains of amaryllis from those that do best in their area.

For several years I have tried to pass on my impressions of the past flowering season and make comments on varieties that might help fans in choosing new varieties. One must understand in doing so I can only comment on the varieties as I have seen them in my area and impressions I receive from friends who write me regarding the season.

For the past few years I have quit trying to grow every variety introduced. Many of the new varieties of certain growers I have not seen and can not comment on them. Generally I have grown most new varieties of the Hadeco African and Van Meeuwen Dutch Strain and can provide you particular comments on these that may be of value to you. In my comments one must keep this in mind and if your favorite varieties are not mentioned the reason may be that I am not familiar enough with it to comment on it.

I have had numerous requests to comment on the differences in the several strains of amaryllis grown in Holland. This is rather a difficult task for there are surely exceptions to anything I say as many varieties will do better for you than for me. We all have our personal likes but being of a daring nature I will try.

There are three main Dutch firms; Ludwig & Co., W. S. Warmenhoven and Van Meeuwen & Co., who grow amaryllis to offer for sale in the United States. A fourth firm from South Africa, The Harry Deleeuw Co., also sells fine amaryllis in the United States as the Hadeco African [grown] Strain.

Ludwig & Co. specializes in named clones and all his varieties are registered by name and color to the show table trade. They have the largest listing of varieties and offer the greatest number of different colors and shades. Once a year they issue a beautifully illustrated color catalog and sell both to the wholesale and retail trade. Their varieties, 'Apple Blossom', 'White Giant' and 'Ludwig's Dazzler' along with others, have been some of the few varieties that have become standard commercial varieties.

Ludwig & Co. is possibly best known for their pink varieties as they are the only firm who offers amaryllis in the lighter solid pink color. Their varieties, 'Dutch Belle', 'Flora Queen' and 'Eastern Dream', are outstanding in this color. However I have some difficulty in growing them as I feel they get their pink color from *Amaryllis reginae* which I also find hard to propogate. 'Flora Queen' does best for me and it appears to have genes from the species *A. psittacina* in it. *A. psittacina* grows better here and so does 'Flora Queen' (than other Ludwig's pinks). Their older variety, 'Pink Favorite,' is a most popular darker pink or rose pink. It is one of the giants in amaryllis. I have seen blooms twelve (12) inches in diameter on this variety.

Their more recent introduction of the picotee types have proven extremely popular and are exceptionally beautiful. This type is white edged bright red and often spotted or flushed red. They are unusually beautiful, easy to force in flower but somewhat difficult to cultivate. They do flower from very small size bulbs however and normally a 20/22 cm size bulb will make a flower. Some new varieties make larger bulbs but large bulbs are rare in this type.

Ludwig & Co., has developed a number of fine whites. Among them are 'White Giant', 'Marie Goretti' and 'Ludwig's Dazzler'. 'Salmon Bouquet' and 'Beautiful Lady' are well known. 'Trixie' is a favorite rose variety. 'Margaret Rose' is a favorite in shrimp pink. 'Love's Desire' is a favorite pink and white. They have many other varieties in different color shades.

The W. S. Warmenhoven firm specializes in unnamed amaryllis clones and are mostly sold to the wholesaler for the garden store trade. They also list a number of named varieties. Many of these varieties have been on the market for years and most of them have been of proven merit as they have stood the test of time. However like in anything else the newer ones are the most exciting. This firm also sells quite a number of amaryllis blooms to the florist trade in Europe.

I have found the W. S. Warmenhoven strain to be the largest flowering strain under ordinary culture. They are the easiest strain, as a whole, for me to grow and hold over to flower year after year. They do not make exceptionally large bulbs or W. S. Warmenhoven does not choose to force them to large sizes. They normally flower successfully from a 26 cm size. I do believe this strain has more of the Leopolii species in it which accounts for their easier growing habit especially in my area. I have found other varieties that I am quite sure have more of the Leopolii species in them grow best here. 'Moreno' I find to be one of the easiest varieties to flower year after year. It is a dark wine rose red and has the characteristic white tip on the petal which I feel is a Leopolii characteristic. I am sure some will disagree with me on this. I feel 'Moreno' gets its color from Leopolii as this species in my opinion is where most of the purple in amaryllis originates.

The variety 'Golden Triumphator' is the most popular variety of W. S. Warmenhoven's. It is a beautiful blend of golden orange and white, is relatively large and vigorous. I find it imparts its vigor to its seedlings and in this respect makes a fine seed parent. 'Floriade' is another blended type, white striped and flushed pink. It is the largest I know of in this color but not as refined in color as other pink and whites. It is not as vigorous for me as 'Golden Triumphator' but a reasonably good variety. Both varieties are very popular. 'Little Diamond' is in my opinion, (if you have the true variety) the most beautiful pink. It is not a solid pink as Ludwig's pinks but more of a blend of pink and white. It is perfectly round with very good size flowers on a medium size spike with perfect proportions in every way. It would be on any list of my five favorite amaryllis. It is a real picture and often flowers two spikes at the same time, each with four (4) blossoms.

Warmenhoven's 'Orange Wonder' has been considered one of the best orange varieties for a number of years. It is a real wonder for most orange clones degenerate in a few years to scarlet. This one holds its color and is used extensively in breeding as a result of this quality. Their 'Queen of the Whites' I find is a good seed parent and makes strong seedlings but often it is a poor grower itself. It is loose and flaring but imparts good characteristics to its seedlings.

The Van Meeuwen firm specializes in early flowering prepared bulbs for Christmas flowering and their varieties are particularly adaptable to forcing. They generally sell to florist and to retail garden stores. Their sales are strictly wholesale. Since many of their bulbs are for counter sales and mostly for forcing for Christmas flowers they have developed varieties that make large bulbs that hold their roots well as this enhances them for counter sales and for forcing. They have been very successful in delivering their bulbs in good condition. Their varieties have been mostly red and white, the colors wanted most for Christmas time. However recently they have expanded their color range and improved their varieties. Their newer varieties are in soft salmon, apricot, shrimp pink, pink and pink & white as well as red shades and white. Many of their new varieties have proven excellent exhibition types as they have dominated many shows in Holland.

The Van Meeuwen company has introduced practically a completely new list of varieties in the past few seasons. I have flowered all of these and have been impressed with many of them.

The leading Van Meeuwen red is 'Belinda'. It is a medium dark red of extra fine quality. It holds its roots well and is very easy to force in flower early. It makes a large well rounded and flat bloom on a medium size spike. It is one of the very best reds available today. Whether this will be true next year or in the future time can only tell. 'Athos' and 'Baruta' are two similar new red varieties. 'Athos' is possibly somewhat larger and more massive as the petals are definitely wider. 'Baruta' is darker. They both appear to be worthy varieties. They, however are not quite as early flowering as 'Belinda'.

In the brighter reds 'Carmen' and 'Volcanus' are exceptional in color having an irridescent glow. One is a brilliant carmine and the other a fiery glowing orange red. These two while not as large as most reds make up for their size by their brilliance.

A real giant in amaryllis was introduced by the Van Meeuwen company last season. This was 'Valaspar'. It is massive in every respect; the plant, the spike and the flower. It is a huge variety and a very beautiful one of orange red color. One year's performance was spectacular. Let's hope it continues this performance. A similar clone, 'Cicero', performed quite well also. Both of these varieties appear to be improvements in this color amaryllis. 'Samson' also is a new large flowering amaryllis. It is a wine or burgandy red. I would describe it as in the wine red class that would have 'Red Master' as a rival. It is large like 'Red Master' but more cup shaped. I feel it has better color and makes four flowers per spike while 'Red Master' generally makes two to three. Also one can not compare size of amaryllis as a spike flowering only two blooms will generally be larger. The older wine red variety, 'Mars', is liked by many. It has a crepe paper textured petal that is delicately beautiful. It however sunburns easily and has to be protected.

In the orange colored varieties Van Meeuwen's 'Adinda' has created a great deal of favorable comment especially down New Orleans way. It is a soft light orange self color and extremely flat and wide open. 'Fire Flame' is another orange that has caused quite a lot of comment.

It is more of a fiery orange. It has very intense color.

In orange and salmon blend 'Loveliness' is very similar to Ludwig's 'Margaret Rose' and Warmenhoven's 'Sweet Seventeen' and is exceptionally free flowering. Fans will disagree about which is best as all are good varieties. The Van Meeuwen Company introduced 'Glorious Victory' last season. It is a golden orange and white blend, practically an exact copy of 'Golden Triumphator' and appears to be much like that variety. The real eye catcher is 'La Paloma', a new apricot and white blend, much more refined and softer colored than 'Loveliness', 'Margaret Rose' or 'Sweet Seventeen'. It is a beautiful thing and apparently a very good variety as everyone I know had wonderful success forcing it last season. It is I believe an outstanding introduction.

The Van Meeuwen company has offered two pink and white varieties consistently for several seasons. They are both similar to Ludwig's variety 'Love's Desire'. 'Rose Marie' is extremely early and may be somewhat larger than 'Rose Elegance' which flowers just a little later. 'Rose Marie' is best when purchased and flowered immediately. 'Rose Elegance' appears to stay dormant in storage much earlier and makes a better late flowering variety.

'White Christmas' has been Van Meeuwen's leading white for several years. It is an extremely free flowering white particularly for forcing for Christmas and will flower from rather small size bulbs.

The South African firm of Harry Deeleeuw & Co. which raises the African grown Hadeco strain offers named and unnamed clones for early forcing. These bulbs are raised in open fields from offsets and many fanciers in the south prefer them to the Dutch strains as they feel they are more vigorous for outdoor planting. They also increase by offsets more rapidly than most Dutch varieties. Being raised in the southern hemisphere newly imported bulbs flower the first year in the fall and are used for early flowers as they, being harvested in June and held under cold storage, will generally flower in five (5) weeks when potted up. The Hadeco African grown amaryllis usually arrive in October and are held under refrigeration until sold to the retail or florist trade.

The Hadeco African grown strain amaryllis were developed from some amaryllis that had *naturalized* in South Africa. They were mostly Dutch strain bulbs. The original naturalized varieties were orange red and medium in size. Their first introductions show this influence as most are of the orange red color and a few had smaller medium size flowers as well as bulbs. 'Tangerine' is possibly the best known early introduction. It makes clones not much larger than 24 cm but will throw as many as three spikes having four flowers five to six inches in diameter. It is a nice orange color and makes a wonderful pot plant. It also multiplies rapidly.

Another early introduction was Clone 65, an exceptionally beautiful scarlet of good size. Bulbs of this variety tend to be rather small and a 26 cm is large. It is exceptionally free flowering. It is now registered under the name, 'Africana'.

'Orangedale' was another early introduction in a beautiful light orange color. It has now been discontinued due to propagation difficulties. I, however, have several bulbs of this variety and everyone I know who has them prize them as it appears to like the south.

Possibly the most sensational of the early introductions, still an orange tone, was 'El Toro'. This is a beautiful golden orange and I am proud to have named it. It is still offered by the company and has proven to be a fine variety.

Hadeco Clone 71 originally offered for sale under the name, 'Satsuma', was extremely popular last season. It has officially been named 'Swahilio'. This is a beautiful orange red or scarlet.

More recent introductions have been some very beautiful rose red varieties. They have been well received by the public and are possibly among the very best available in this color today. 'Coral Seas', 'Red Sails' and 'Watusi' are fine varieties in this color. 'Calabash' is a fine variety in old rose and one that is different from other varieties. By accident I listed this variety as 'Tabasco' last season. It, however, is registered 'Calabash' and should go by this name. Hadeco Clone 242, a beautiful red and white that has been popular for several years has now been officially registered under the name of 'Masai'. The clone introduced as 'Rosetta', an extra large salmon rose has been withdrawn and will be later renamed when officially introduced. It is one to look forward to as it is the largest flower I have seen of the Hadeco strain.

There has been some confusion concerning the names of the Hadeco Strain amaryllis I can report that all clones they considered of sufficient quality and quantity have been officially named and you should be able to buy the same clone anywhere under the proper name. They have many fine clones coming on and will be introducing others from time to time. I was instrumental in naming several of the Hadeco African grown amaryllis, however in the future most varieties will be given a South African name as the manager of the company prefers these names. I am quite sure most of you will recognize the varieties I named such as 'Coral Seas'.

This season I grew a number of varieties from growers other than those mentioned. Two clones which impressed me were 'Pink Attraction' and 'Couliere Cardinal' from S. Warmenhoven. 'Pink Attraction' is not pink but salmon as we would call it. It is a most beautiful soft blend of salmon and white, a large flower but of delicate texture. It is very finely striated. 'Couliere Cardinal' is a deep dark red, very large, free flowering variety that appears to have great merit.

Last season I flowered several hundred of the hybrids from Mexico that were developed by the late Mr. Harrison. There were quite a few large flowering types and some had exceptionally fine and different color tones. Also the small flowering sorts had salmon, salmon pink, and lavender tones.

This season I purchased several and offered them in lots of ten (10) so customers might receive a representative sample. Sales were extremely poor and 10 was obviously not a representative sample for if all did not write me of their disappointment in them surely almost all did. People are just not interested in smaller flowering types and surely expect perfection even in seedlings. All I can do is apologize and tell about several thousand I had left to plant myself.

The Harrison hybrids received this season I believe contain many less large flowering sorts than those I got last season and generally the colors of all including the small kinds were not as good. I did pick out several large flowering sorts which I thought had special merit. These were mostly in rose shades. There were a number of the small sorts that interested me, particularly the netted and striped ones in pink and lavender shades. Generally I consider the Harrison hybrids to be an exceptionally fine strain. However Mr. Harrison made his crosses for his own pleasure and unfortunately the public does not appreciate small flowering types and expect any strain to be selected before they will pay more for them than for the most common varieties such as those sold in garden stores as Meade Strain, an American hybrid of from good to very poor quality. Very few people are interested in the small or medium size hybrids. Yet these in my opinion are the sorts that could be developed into excellent pot as well as border varieties. Their size of flower normally does not deplete the bulb's strength and they could surely be developed to flower year after year successfully whereas the larger flowering sorts seldom will give repeat performance as it takes too much out of the bulb in flowering.

Each season I receive many letters regarding the culture of amaryllis. Invariably they say that after they flower newly imported bulbs, they just degenerate and shrink to nothing in a few years. Most fans would like a fool proof method of handling their amaryllis whereby any bulb they purchased would flower year after year with little or no effort. . . . If culture were as easy as this everybody would be growing amaryllis and they would be selling for 50c each rather than $5.00.

The public wants and demands bulbs that make spectacular flowers when forced and this is what the Dutch growers provide. In order to do this they breed for varieties that have good flowers that will make a prime bulb in the shortest while possible and when potted up will normally give an outstanding flower. The size of the flower you get from a newly imported Dutch bulb is often as much due to the special care it has had rather than the variety. Also an amaryllis usually makes its best flower ever when it reaches maturity. Most varieties grow well for a few years and then become difficult to grow. The Dutch growers also experience this so why shouldn't you. They always have new varieties coming on to replace varieties that become unreliable. This is a never ending process with them. This is why some growers would rather sell clones by color as they do not really think naming them is realistic.

The amaryllis fancier can not expect a great number of varieties to be reliable enough to grow over year after year. They should accept this fact that many new clones will disappear in a few years. And even with those varieties that will grow over successfully most fans do not have the facilities to provide the exacting requirements as the Dutch growers can under their greenhouse culture. However if one understands the basic cultural requirements and will give his plants the attention required he will be successful flowering certain varieties for a number of years. A few pointers will be helpful.

1. The soil for amaryllis must be moist at all times but never soggy. If your plants are placed outdoors in pots the pot should be only slightly larger than the bulb and never over six inches. If the soil when soaked and given a few minutes to drain still contains free water when squeezed in the hand it is no good. A heavy rain will water log it and the roots will rot. The soil for potting when the plants will be set outside should contain fairly large quantities of sand.

2. Soil for potting plants that will be protected from rain may vary a great deal as the water can be controlled but if you use a heavy soil or a soil such as pure sphagnum moss that holds large quantities of water you will surely have to avoid overwatering or the roots will be lost.

3. Do not use green organic fertilizer in the soil as it will cause gas and rot roots. Much trouble is caused by organic matter in the soil. I prefer to use a clear soil and top feed with commercial organic and liquid fertilizer. This reduces the amount of gas generated in the soil.

4. The soil should be slightly alkaline so if your soil is acid add a little lime to the soil.

5. I find it very beneficial to drench the soil to kill insects at least twice or three times a year. I use cygon, however I have heard of excellent results from the use of the nematode control, V C 13. Most of your trouble is in the root area. If you keep the soil clean of insects, gas and excess water and the plant is placed where the soil does not dry out and it gets about 3½ hours direct sun and some shade each day it will normally grow well.

6. Watch the foliage. If it is not growing well knock the bulb out of the pot and usually you will see where roots are dying. If the soil is overly wet this is probably your trouble. If it is not wet then you probably have dirty soil, too much organic making gas or insects making trouble. Wash the bulb off and repot it in clean soil. I prefer no fertilizer until I have roots again. After you get a good set of roots a little liquid fertilizer, then a top dressing and you are off again.

7. This is only for those in the south like myself who often find about August or September your amaryllis are going dormant. Usually foliage appears to be getting limp. Normally here in Florida and other areas where there is heavy rainfall especially when *Alice, Betty and other hurricanes* hit us for a straight week of heavy rainy weather this happens. You are not having an early fall. Your amaryllis have lost their roots. Sometimes they will immediately put out new roots and make more growth but remember they will loose a month or so of growth. Admit it and make plans to eliminate this next season for if you can keep this from happening (and it happens with outside planting as well as potted plants) you will see remarkable change in your amaryllis.

PLANT LIFE LIBRARY—continued from page 126.

NIGHTSHADES, THE PARADOXIAL PLANTS, by Charles B. Heiser, Jr. W. H. Freeman & Co., 660 Market St., San Francisco, Calif. 94104. 1969. Pp. 200. Illus. $5.95. This most interesting book about the Solanaceae or Nightshades, which includes the Chili and other peppers, the tomato, the potato, eggplant, tobacco, petunia and other solanaceous plants has been written with the general reader in mind. The author has brought together a great fund of factual information, fascinating anecdotes and stories about the members of this plant family. It should prove to be rewarding reading for all interested in plants, including the professional plant scientist, amateur gardener, the cook, and above all the interested layman. Once begun, the reviewer could not lay it aside, but had to finish reading the entire book at one reading. Very highly recommended.

THE FLORA OF NEW ENGLAND, by Frank Cokling Seymour. Chas. E. Tuttle Co., Rutland, Vt. 1969. Pp. 596. Illus. $12.50. This comprehensive text provides a means for identifying the vascular plants that grow without cultivation in New England—ferns, herbs, trees, shrubs, vines and aquatics. The area covered is 66,608 square miles in extant and the species included number 3,200. Varieties and forms as well as the larger groups have been keyed, and information on the flowering dates, habitats, and the frequency of the species is given. Very highly recommended.

CONSTITUTION AND BIOSYNTHESIS OF LIGNIN, by K. Freudenberg and A. C. Neish. Springer-Verlag, 175 5th Av., New York, N. Y. 10010. 1968. Pp. 132. Illus. $7.00. This is the second in the series, Molecular Biology, Biochemistry and Biophysics. The present volume deals with the constitution of lignin and with the mechanism of its formation in plants. Radiotracer studies have shown that lignin and related substances, which are unique in plants, are formed from phenylpropanoid substance which is found in all organisms—the essential amino acid phenylalanine. Very highly recommended.

PLANT SCIENCE, AN INTRODUCTION TO WORLD CROPS, by Jules Janick, Robt. W. Schery, Frank W. Woods and Vernon W. Ruttan. W. H. Freeman & Co., 660 Market St., San Francisco, Calif. 94104. 1969. Pp. 288. Illus. $12.00. This forward-looking text on the science of plants and the technology of crop production and distribution, has been written to cover a year's university-level introductory course in plant or crop science—agronomy, horticulture, forestry and agricultural economics. The six parts of the text deal with plants and men; nature of crop plants; plant environment; strategy of crop production; industry of plant agriculture; and the market place. Very highly recommended to all interested in plant science.

BONSAI, SAIKEI AND BONKEI, by Robert Lee Behme. Wm. Morrow & Co., 425 Park Av. So., New York, N. Y. 10016. 1969. Pp. 225. Illus. $9.95. This handsome, profusely illustrated book on **bonsai,** the art of creating natural beauty in miniature by dwarfing trees; **saikei,** the art of employing tiny living plants to achieve a similar result; and **bonkei,** created with artificial materials, are explained in detail. Data on plants for bonsai; sources of information on materials and plants; and an index, complete the volume. Very highly recommended.

1000 BEAUTIFUL HOUSE PLANTS AND HOW TO GROW THEM, by Jack Kramer. Wm. Morrow & Co., 105 Madison Av., New York, N. Y. 10016. 1969. Pp. 178. Illus. $12.95. This guide to plants for indoor growing with particular reference to their decorative uses, and cultural practices, is divided into three parts: (1) general considerations; (2) dictionary (alphabetically arranged) of 1000 house plants; and (3) a brief appendix on kitchen plants; lists of plants, and some plant societies, etc.

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EXPERIENCE WITH AMARYLLIDS

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General. Last winter in the West San Fernando Valley we had our dwellings and grounds well checked out by a record breaking onslaught of wind and rain. One evening during the peak of the storm I stood in my Gro-Lux lamp lighted ''screenhouse'' and fatalistically awaited its being torn into small shreds or being twisted into a useless heap of aluminum and plastic—or even suddenly and completely disintegrating like the wonderful one-hoss shay. However, a network of criss-cross wire strands which I had strung horizontally just above head-top height apparently added just enough to prevent collapse. They reminded me of the wire ''struts'' of the early fabric-and-wood biplane flying machines.

After a sustained battering from these elements we were next subjected to a persistent, relentless series of cold nights. One had the choice of either rushing out with protective coverings every evening or standing close to the comforting warmth of the fireplace, thinking, ''Well, if they can't stand the freeze they shouldn't be grown in this area''. Since I couldn't stand the thought of my plants being thus murdered, I protected as many as I could and was happy to have all of my outdoor amaryllids survive the severe and prolonged exposures. The coldest registered in the screenhouse was 48° F.

There is one outstanding aspect of growing plants under Gro-Lux lamps with thermostatically controlled bottom heat: it's expensive! One day last winter a solicitous employee of the Department of Water and Power called to discuss what he called an ''alarming'' rise in our power consumption during the Fall-Winter billing periods. Although nothing helpful could be done about it, his concern was warranted: my records show that from October 1968 through April 1969 the increase in electrical power cost averaged $22.35 per month.

Nevertheless, I adjudge that the generally better germination and faster and healthier growth is easily worth the added cost and the closer attention required. There has been a remarkably low incidence of disease and infestation; and plant losses, except for those specifically noted with respect to certain seedlings, have been abnormally low. I have even brought in potted plants from an outdoor location into the screenhouse for ''sick bay'' treatment, with immediate improvement in growth.

Again in 1968 the plants in plastic juice pitchers outgrew those in clay pots. Further, those in pitchers flower at least one season sooner. As usual, those not kept for breeding purposes were rogued out after flowering. When examined after removal from pitcher or pot, those in pitchers showed more vigorous root growth.

By now I have developed two basic soil mixes for seed germination, seedling growth and growth in pots to maturity: a standard *Amaryllis* soil mix and a standard "Rain Lily" soil mix. The former consists of loam, plus humus, plus oyster shell and Terralite. The latter consists of the above plus oak leaf mold, and has a higher proportion of Terralite. In the deep plastic dish pans I use for seeds, the use of a bottom layer of ¾-inch gravel has been discontinued. As I fill the flat (pan), I add bone meal to the bottom four inches of *Amaryllis* soil mix, and Milorganite to the "Rain Lily" soil mix. As I progress toward the top of the pan I mix in more and more Terralite until the top inch is wholly Terralite. Seeds are sown in holes pressed in with a blunt tool of appropriate diameter, spaced so that seedling growth can continue in the pan until the one and only shift into the final individual container or outdoor location.

Amaryllis hybrids. Progress was made in my four objectives: improved basic breeding stock; improved procedures for next-generation production; improved bi-generic cross techniques; increased knowledge of chemical and gas treatment techniques. The plant parents now combine repeat flowering, disease resistance, rapid maturation, generous production of viable seed, evergreen foliage, and good flower form and color. Fragrance hasn't yet been tied into the standard characteristics. The tendency to accept bi-generic crossing has been markedly increased; there are no complete successes to report, but seed production proceeds much further before final cessation of the triggered sequence.

With pollen from this stock, crossed onto *A. striata,* plants from July 1968 germination are, within 12 months, already crowding their plastic juice pitchers with numerous offsets clustered around the main bulbs which appear to be very close to flowering size.

One of the breeding stock plants combines a group of very desirable qualities with an undesirable trait of producing a scape with a slight "S" waviness. This was crossed with a plant whose repeat-flowering scapes are noticeably arrow-straight. It will be interesting to learn which tendency is dominant. Onto a white with fine red pencilling, which has no particular virtue beyond an almost compulsive desire to set seed, the pollen from another white with fine red pencilling was applied. The pollen parent sometimes has pronounced reddening of the edges and tips of its leaves. The seedlings of this cross generally have reddish leaves. Two plants have occasionally produced completely red-toned leaves, one with a white stripe running up the middle from base to tip.

This year's crop consisted of seeds mainly larger and healthier looking, with fatter embryos. Germination is more complete, more uniform and more vigorous. The best event of this year's effort is that my favorite plant, which is an excellent seed and pollen parent, is sending up its third strong scape which should be displaying flowers again by mid-August.

Amaryllis argilagae. A bulb which was about 13 mm in diameter when received in October 1966 is now solidly leaved out and healthy in its plastic pitcher. One evening in February 1969, while checking over all my screenhouse plants, I saw what appeared to be a stray piece of soil up in the leaf base. It turned out to be a small bulblet which had apparently floated up on the daily water and lodged in the leaves. I plucked the pitcher out of its spot, set it on the floor, hunkered down over it and started gently removing the material surrounding the bulb base—as an archeologist might pick away soil from an interesting find. There in the top layer of ¼-inch white rock was another bulblet, and another—and another—and another! With my ever-present long-nosed surgical tweezers I continued carefully removing bulblets as I went through the ¾-inch thick top layer of rock and down an inch into the soil around the main bulb, until I had retrieved 38 bulblets! Their size ranged from 7 to 12 mm in diameter, and from 11 to 22 mm long. Others, being not completely formed at that time, were left attached to the bulb.

When I washed them, all floated lightly on the water. I planted them in a plastic dish pan in a rich but sandy-gravelly soil mix. Starting 12 months later, I periodically dug up and replanted a few of the bulblets, which remained firm and healthy but made no root or leaf growth. Many differing combinations of light hours, light intensity, bottom heat, dryness and moisture were tried with no sign of growth. Finally, on 24 July 1969, 17 months after original planting, I dug them all up and replanted 36 (two had rotted) in my standard ''Rain Lily'' soil mix, after dipping them in Rootone powder and blowing off the excess.

Amaryllis striata. Although they survived the rain and cold of last winter, my bulbs (which were in a southeastern exposure) almost stood still until the weather completely warmed up in late June. The clump bravely sent up scapes in December 1968 and January 1969. The latter had its flowers torn completely off by the wind. In July 1969 I lifted them all and potted them in a rich soil mix, preparatory to giving them the protection they will apparently need when the cold returns next winter.

Allium unifolium. Being unsure of the correctness of identity, some of my dormant bulbs from two sources were sent to Dr. H. P. Traub for growth and identification. Those from one source which I planted in a shaded raised planter put up lush growth and graceful scapes topped with umbels of flowers which ranged from pale pink to rose-violet. They set seed readily. When dormant, they were dug. Apparently they use up the old bulb pushing up the leaves and flowers, then form a new bulb. The seed were not sown when fresh, but were ripened and will be held over for sowing in-place outdoors in the springtime.

Alstroemeria aurantica. In October 1968 a baker's dozen of small roots were planted close together in a pocket of relatively sandy soil against the house in a southeast exposure. All survived the winter and have grown acceptably well. The clump increases in size by alternate spurts of rapid growth of individual stems and sudden cessation of growth and drying up of the stems, again individually, followed by the growth of new stems, taller and stronger. The net result has been a steadily enlarging clump to 15 inches high in late July. There are thus far no signs of flower bud formation.

Cyrtanthus rhododactylus. Fifty-eight seeds received in June 1969 from Dr. H. P. Traub were sown in a ''Rain Lily'' soil mix, with bottom heat and a clear plastic cover under Gro-Lux lamps. Germination started in 17 days. By the 26th day germination was continuing, and there were 22 seedlings with flat sword-tip leaves up to 3.5 cm long. The seeds were very thin, with no sure evidence of an embryo; the vigorous growth was, therefore, a pleasant surprise.

Habranthus andersonii var. *roseus.* In this climate zone, this pretty little flower has demonstrated that it prefers to blossom when it jolly well feels like it. Then, when they're ready, up they pop! You had better keep an eye on them, or all you'll get to see is an emptied seed pot. In almost two years from seed sowing, mine flowered in a shaded coldframe on 10 September 1968, then 15 September, then the 16th, the 21st—then they suddenly stopped. Seed pods split open, also without advance yellowing, in about 20 days. So the scape and unripe pod must be brought indoors where it will ripen readily while standing in a glass of water under artificial light. I moved the bulbs to a Birch tree well, with morning sun exposure. This year they flowered in July, but with the same jack-in-the-box pop-up action. Between 1 July and 13 July there were 10 scapes on 7 bulbs, one bulb simultaneously supporting a scape and seed pod, a 10 cm scape and flower bud, and the pink tip of a third scape. Although short-lived, the flower and scape are gracefully proportioned, with the rose-pink flower (pale pink with very close deep red parallel lines) proudly held about 45 degrees above the horizontal. They set seed well, about 36 to the pod, and the seeds germinate with no hesitation.

Habranthus cardenasiana. This plant also sends up its flowers right in front of your startled eyes. Of three I have in a plastic pitcher in standard Amaryllis soil mix, one has flowered twice in rapid succession. My record shows: 30 May 1969 6 PM—first noticed when 3.5 cm tall; 31 May 7:30 AM—12 cm tall; 31 May 7:50 AM—flower opening, deanthered; 31 May 11:15 AM—free antheres open, to refrigerator; 31 May 4:00 PM—flower half open; 1 June 10:00 AM—flower full open, pink flush on petal edges, deepest at tips; 1 June 10:15 AM—applied *Amaryllis striata* pollen; 1 June 5:30 PM—flower withered. Unfortunately, neither this cross nor one tried on 14 July resulted in seed.

Narcissus. My seedlings continue to furnish suspense and pleasure as they flower for the first time, one after another. They also supply welcome highlights of bright color in February and March. This year another seedling has demonstrated strength and character; it holds its face up so perky and bright that I have unofficially named it 'Dottie B.,' for my sister, Mrs. Melvin E. Dawley of Bronxville, New York. She will receive some of the firm, healthy bulbs in late August, in time for her birthday and the eastern planting season.

Nothoscordum neriniflorum (Herb.) Benth. & Hook. f. Seeds received from Dr. H. P. Traub in October 1968 were germinated in water, then transplanted into a plastic pan in a special "sandy" soil mix containing fine decomposed granite and Terralite. Of 54 seeds, only 19 survived this treatment. In April 1969 they were set outdoors in a shaded coldframe. At that time they had onion-bulb-like swellings, 3 mm in diameter by 5 mm long at 2.5 to 3 cm below the soil level, with weak rush-like fine leaves. Only 12 survived this transplanting, but in two months time their leaves have thickened and strengthened, and they appear to be thriving.

Rhodophiala x *huntiana.* After excellent germination in late 1966, followed by the appearance of their second leaves, many died in 1967 from some affliction which dried up their roots and shrivelled the bulbs. After being transplanted to a shaded coldframe, the remainder flourished and developed strong, but unusual, bulbs as they pulled themselves deep into the rich soil. From the old original bulb near the surface they developed an undulating bulb growth tapering from 5 mm in diameter at 1.5 cm below the soil surface to a bulbous enlargement 16 mm in diameter at a depth of 18 cm. The roots were attached to this bottom enlargement. Leaves were strong and upright, to 45 cm. The bulbs were transplanted in September 1968 to a Birch tree well with a southeastern exposure, where they rested during the winter, then started new leaf growth in June and July 1969. There have been no flowers yet.

Sprekelia formosissima. As flowers emerged from outdoor bulbs in May 1969, while we were experiencing chilly weather, I tried to get them to set seed. All flowers withered quickly without setting seed, and I am now waiting for the late summer flowering so I can try again, this time supplying heat to them during the cool nights.

Zephyranthes. More were added to the breeding stock during 1968, so that the flowering season will be stretched out some, with more kinds available for crossing. Late July to mid-September is the flowering period for my *Z. citrina.* In 1967 and 1968 they popped up at that time in a constant succession, and produced seed copiously. Seedlings have all done well and show promise of good bulb growth supporting the excellent leaf growth. The smaller tender leaves require constant and complete protection from birds, mice and snails, similar to that required for the emerging scapes on the mature plants. As I write this I recall that I recently picked up several pieces of leaf left over from a bird visitation, during which they had plucked at the leaves which protruded through the hardware cloth screen over the plants. Happily, the bulbs produce leaves faster than they are stripped. *Z. drummondii* sent up a flower when I wasn't looking their way on 1 July 1969 and again on 3 July. They both set seed and developed fat pods which opened in 19 days to release healthy, plump seeds. The seeds from one of the pods were left in the open to "ripen" for one day; the fat seeds became hard, flat, dry discs—so I sowed them quickly with a high-moisture-control plastic bag over the flat. Outdoors the clones 'Kitty

Clint' and 'Ruth Page' have produced strong leaf growth, indicating that their flowers will be large and lovely. From Dr. H. P. Traub 22 seeds of *Z. morrisclintii* were received in June 1969 and were sowed in the standard ''Rain Lily'' soil mix in a deep plastic pan with bottom heat and a clear plastic cover under Gro-Lux lamps. In 10 days germination was excellent, and growth has been vigorous, with leaves up to 10 cm long in 17 days. The leaves are typically fine and rush-like.

Chemical treatments. Since 1962 I have been experimenting with exposure of seeds, seedlings and bulbs of several kinds of plants to a colchicine-water solution. By now there are enough results on amaryllids so treated to warrant making a few generalizations. Some of these results are described in the following. The primary effect is one of stunting root and stem growth and distorting plant and flower form. In the descriptive matter below when I speak of ''the solution'' I mean ½ tsp of colchicine powder (a local biochemical supply house carries it as #234115, ''A'' grade, in 1 gm bottles) in one litre of tap water. The expression ''soaked'' usually means that seeds were put into enough of the solution in a glass tray or jar to keep the seeds wet; if necessary, more of the solution was added as it was absorbed or evaporated.

Agapanthus. Seeds from a tall white-flowered plant were gathered 12 October 1968; 24 were put in the solution. Starting after a 48-hour soak, six seeds were sowed each 24 hours, so that the last six had been subjected to a 120-hour soak. As a control group, another 24 were sowed without being soaked in the solution. Of the 24 which had been soaked, only seven germinated, and six survived to be planted outdoors in a shaded coldframe. Of the 24 which had not been soaked, only 11 germinated and only four survived to be planted outdoors alongside the others. There is no apparent difference in the growth of the plants in the two groups, and their coloration is similar. When last lifted and transplanted to the shade of a tree, all had strong root growth.

Allium unifolium. Bulbs from two sources had different appearances; these were therefore identified by the source (one as ''O'' and one as ''P''). Ten ''O'' and 9 ''P'' were soaked. The ''O'' were removed from the solution and potted as follows: 3 after 25½ hours, 4 after 48 hours, 3 after 63½ hours. The ''P'' were removed from the solution and potted as follows: 3 after 27 hours, 3 after 64 hours, 3 after 77 hours. All pots were kept indoors under Gro-Lux lamps. Growth of all was hesitant and weak; none flowered. Only one of the ''O'' survived to be transplanted outdoors in a raised shaded planter where non-soaked ''O'' bulbs had grown vigorously and flowered well. None of the ''P'' survived.

Amaryllis. From a cross made in 1964, 89 seeds were soaked in the solution for 24 hours. Germination was good (84), and almost all survived to become individually potted plants. Most were healthy and strong and, as they flowered, had long, upright leaves. In 1967 they started flowering, and a few also flowered for the first time in 1968 and 1969. Most have shown strong, upright leaf growth, glaucous, and tall, straight scapes; but of 11 which have flowered to date, only one had what I consider good flower form. Some are being used as seed parents because of their good foliage, which tends to remain evergreen, and their prolific production of offsets.

Another experiment was made in 1964 using purchased seeds which were supposed to result in flowering size bulbs in 15 months. To try to check the results of longer soak times, 10 were sowed after a 48-hour soak and 10 after a 72-hour soak. From the first batch there were six seedlings, with strong leaves and roots. Of these, four weakened and died, and the two remaining plants, although they have not flowered, have exceptionally vigorous leaf growth and large, firm bulbs. From the second batch there were eight seedlings, all with weak leaves and roots. Four survived: one is small in leaf and bulb; one is medium sized with long, loppy leaves; one is medium sized with leaves whose edges curl inward over the shorter and smaller leaves, forming a semi-sheath from which succeeding leaves emerge with difficulty; the fourth has medium long but wide leaves, and this spring sent up a tall, straight scape bearing a brace of magnificent flowers whose color is described in my notes as a ''glowing rose-purple that shows some *blue*''. To one flower I applied pollen from a well-formed large white and to the other I applied *A. striata* pollen. Both produced seeds in 42 days: the white flower cross produced 42 seeds, of standard shape with extra large embryos; the *A. striata* cross produced 16 seeds, all twisted but with fat embryos. The former batch has started germination with strong, healthy leaves. The latter has not yet started germination, but sneaky examination of some seeds shows that they are still alive and appear ready to start growth. The mother plant's pollen produced top quality seeds from two selected seed parents, one being the reciprocal cross. Germination is good from these two batches. I must conclude that there is no evidence that the treatment affected the plant's reproduction. Additionally, I must confess that my strongest interest is almost always with second generation seedlings of special crosses or treated plants.

Chlidanthus fragrans. Along with bulbs which were not soaked, two bulbs were soaked for 102 hours. At first the soaked bulbs produced longer and stronger leaves (I failed to soak the other bulbs in plain water; perhaps it would have caused better growth). The flower seemed normal in all respects but did not set seed. When last transplanted, the soaked bulbs had divided into six small bulbs. Presently it is the non-soaked bulbs which have longer and stronger leaves.

Ixiolirion tataricum. Of 52 bulbs, 27 were put in the solution in September 1968; they were potted in standard Amaryllis mix as follows: 5 after 26 hours, 5 after 39 hours, 5 after 52 hours, 6 after 75 hours, 6 after 99 hours. The 25 non-soaked bulbs were also potted the same way. Under Gro-Lux lamps leaf growth of both groups started soon and vigorously, then declined. When the bulbs were transplanted to outdoor locations, 23 of the non-soaked bulbs had survived, but only 11 of the treated bulbs were still there.

Lycoris aurea. Of six soaked for 24 hours in October 1966, leaf growth has been weak and they have not flowered. In November 1968 only one showed leaf growth, which was still weak.

Narcissus. Ten 'King Alfred' seeds were soaked for 24 hours in 1964. All grew well and, when second-year seedlings, had leaves taller and more slender than normal. In March 1969 two flowered, one a brilliant yellow self on a very short scape, the other a small bright yellow self with folded-back petals. Three had spindly leaf growth and rotted. The remaining five had slender leaf growth but, when lifted in June 1969, had hard bulbs with no evidence of disease or weakness. Many bulbs were soaked for 24 hours prior to planting. Also, some were lifted while in full growth, washed clean, soaked roots and bulb for 24 hours and replanted. To date there is no visual evidence of any effect on growth or flowering.

Nerine undulata. Five bulbs soaked in 1966 for 72 hours may have been affected by the treatment. Leaf growth has been weak and sporadic, and they have not flowered.

Sprekelia formosissima. Five bulbs soaked in 1966 for 72 hours had root and leaf growth starting when the bottom halves of the bulbs were immersed in the solution. After a reluctant start they grew well in 1967. In 1968, after being slowed down by the winter cold, they grew well during the summer, with one plant noticeably larger than the others. In 1969 their growth has been slower and did not show vigor until the full heat of late June. Leaf growth is much smaller than that of a control group of bulbs not soaked. The latter has flowered, but the treated plants don't look large enough or strong enough to put out a decent flower.

Zephyranthes citrina. In 1965 five bulbs were soaked for 48 hours. Their growth appears to be no different from that of bulbs not soaked. They have flowered, with no visible differences. However, although those not treated have provided several batches of good seed, there has been no seed produced by the treated bulbs.

Irradiated seeds in special solution. From Mr. Russell H. Manning, who described his experiments in this area in the 1969 Plant Life, I obtained 20 seeds of "mixed *Amaryllis* hybrids 15,000 Rn" and several hundred seeds of "*Habranthus robustus* 15,000 Rn". Both groups of seeds were flat and very dry, with no sure evidence of embryos. These seeds were soaked in the solution described below and were planted in four groups after 24, 48, 72 and 96 hours in solution, respectively. One of the 24-hour soak *Amaryllis* seeds and one of the 48-hour soak *Amaryllis* seeds have germinated, but they are reluctant to put out a second leaf, although such growth is long past due. Of the *Habranthus* (108 planted) only one of the 48-hour soak seeds germinated, but it quickly died. There is no sign of life in the remaining seeds, although I continue to care for the seed pans. The solution in which I soaked the seeds was my standard colchicine solution plus ½ tsp Amchem Rootone powder (USDA Registration No. 264-29) and ½ tsp Gibberellic Acid (Wonder-Brel, USDA Registration No. 2125-35) per litre of solution. *Hemerocallis* seeds received from Mr. Manning were forwarded to my brother Rolland W. Tisch in Marne, Michigan; he is now retired from active full-scale nursery and greenhouse operation and is spending more effort on experimental breeding. It is expected that reports of his results will be forthcoming in a few years.

Several flowering size *Amaryllis* bulbs which I injected with Gibberellic Acid solution in 1966 showed early leaf growth in 1967 but did not flower as well as usual. Some of them came around to normal flowering in 1968 and 1969, but some of them have not flowered since 1966 and had a decline in leaf growth after the first flush of accelerated growth.

Miscellaneous Observations and Random Musings. We are gradually creeping up on a condition where we will have some amaryllids in flower the year around. And some day I hope to have nothing but my own seedlings on the place. We still enjoy the cheerful blue of *Tristagma uniflorum violaceum* each springtime; it multiplies rapidly and has now been spread out as an edging flower along the rose bed path. It also goes very well with Daffodils. This summer we added two bulbs of *X Crinodonna corsii,* clone 'Frank Howard,' just for the clear, bright pink color and the sweet fragrance, even though it cannot be used for breeding. Nontheless I have orders to get more for the shady quiet of our back yard lanai. Having reached the advanced age where a gentle Saturday afternoon nap is one of the greatest things in the world, I particularly enjoy my insect-free, cool, good-smelling screenhouse, where I have installed a comfortable chaise lounge upon which I drift away into a land where all crosses set seed, all seeds germinate and all *Amaryllis* are brilliant yellow or sky blue!

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INTERPRETIVE FLOWER ARRANGEMENT, by Nelda H. Brandenburger. Hearthside Press, 381 Park Av. So., New York, N. Y. 10016. 1969. Pp. 157. Illus. $6.95. This profusely illustrated book on how to express yourself with plant materials is divided into three parts: (1) design elements for the arranger and exhibitor; (2) interpreting the arts; and (3) impressions of the world, seen and unseen—seasons and times, people, places and things, moods, emotions and feelings, and holidays. Highly recommended.

FLOWER GROWING FOR FLOWER ARRANGEMENT, revised edition, by Arno and Irene Nehrling. Hearthside Press, 381 Park Av. So., New York, N. Y. 10016. 1969. Pp. 228. Illus. $5.95. Originally published as "Gardening, Forcing, Conditioning and Drying for Flower Arrangement" by these outstanding authorities in this field, this revised enlarged edition will be welcomed by gardeners and flower arrangers generally. The subject matter includes garden design; shrubs and trees; annuals; perennials; bulbs, corms, rhizomes and tubers; vegetables; herbs, gourds; how to cut and condition; forcing flowering branches; plants for drying; aids for the arranger; and selecting plants by color and season. Highly recommended.

USING WAYSIDE PLANTS, 4th enlarged edition, by Nelson Coon. Hearthside Press, 381 Park Av. So., New York, N. Y. 10016. 1969. Pp. 288. Illus. $5.95. This 4th edition of this popular book on the useful plants of the northeastern United States now includes also new sections on poisonous plants, camping, and planting the wild flower garden. This book is indispensable to the outdoors enthusiast, camper, teacher, and scout. Highly recommended.

THE GENUS **UNGERNIA** BGE.

Zinaida T. Artjushenko, *Komarov Botanical Institute,*
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Bunge proposed the genus *Ungernia* in 1875, describing *U. trisphaera* (Fig. 33). The species *U. sewerzowii* was described by Regel in 1868 under the name *Lycoris sewerzowii* (Fig. 33). In 1915 B. Fedtchenko transferred this species from the genus *Lycoris* to the genus *Ungernia.*

Working on the genus *Ungernia* for the ''Flora of USSR'' in 1935 Vvedensky described 4 new species: *U. ferganica* Vved., *U. minor* Vved., *U. victoris* Vved. and *U. tadshikorum* Vved. Having described the species in Russian, Vvedensky did not give Latin diagnoses.

A year later M. Popov in co-authorship with A. Vvedensky described a new species of *Ungernia* with a short latin diagnosis—*U. oligostroma* M. Pop. et Vved (M. G. Popov and N. V. Androsov, 1936). It became known later that this new species is one of the species Vvedensky described in the ''Flora of the USSR'' as *U. minor* Vved. Since this species had no Latin diagnosis, *U. oligostroma* is the right name. In describing his species the author did not indicate any distinguishing features pointing to the affinity of the species. This made it difficult to determine the relationship among the species as will be indicated in the discussion below.

Traub & Moldenke (1949) listed eight species, *U. minor, U. victoris, U. flava, U. sewerzowii, U. trisphaera, U. ferganica, U. tadshicorum* and *U. oldhamii.*

U. flava Boiss. et Haussk (1884) is based on the Hausskencht specimen from southwestern Iran. Baker (1888) writes that it grows together with *U. trisphaera,* and differs from the latter only in the yellow flowers, and shorter perianth-tube gradually dilated from the base to the apex. Bossier gave an incomplete description, omitting mention of the bulb and number and size of leaves. The diagnosis was based on herbarium specimens, and thus the color of the perianth mentioned is not natural. Until living specimens can be studied, the validity of this species cannot be established.

U. oldhamii Maxim. (1885) was published with a question mark after the generic name *(U. ? oldhamii)* and with the notation that there are 12—15 ovules in the ovary, a condition not recognized in *Lycoris.* In spite of this, Maximowicz later wrote *''Lycoris sanguinea''* on the herbarium sheet, thus removing the specimen from *Ungernia* as far as he was concerned.

U. minor Vved. (1935) is a synonym of *U. oligostroma* M. Popov et Vved., as already indicated.

U. spiralis E. Proskoriakow (1949) was based on specimens collected by N. B. Androsov, who grew the bulbs in the Botanical Garden of Turkmenia, and described them. This description was added to by Proskoriakow, but the bulb was not mentioned in the description. In

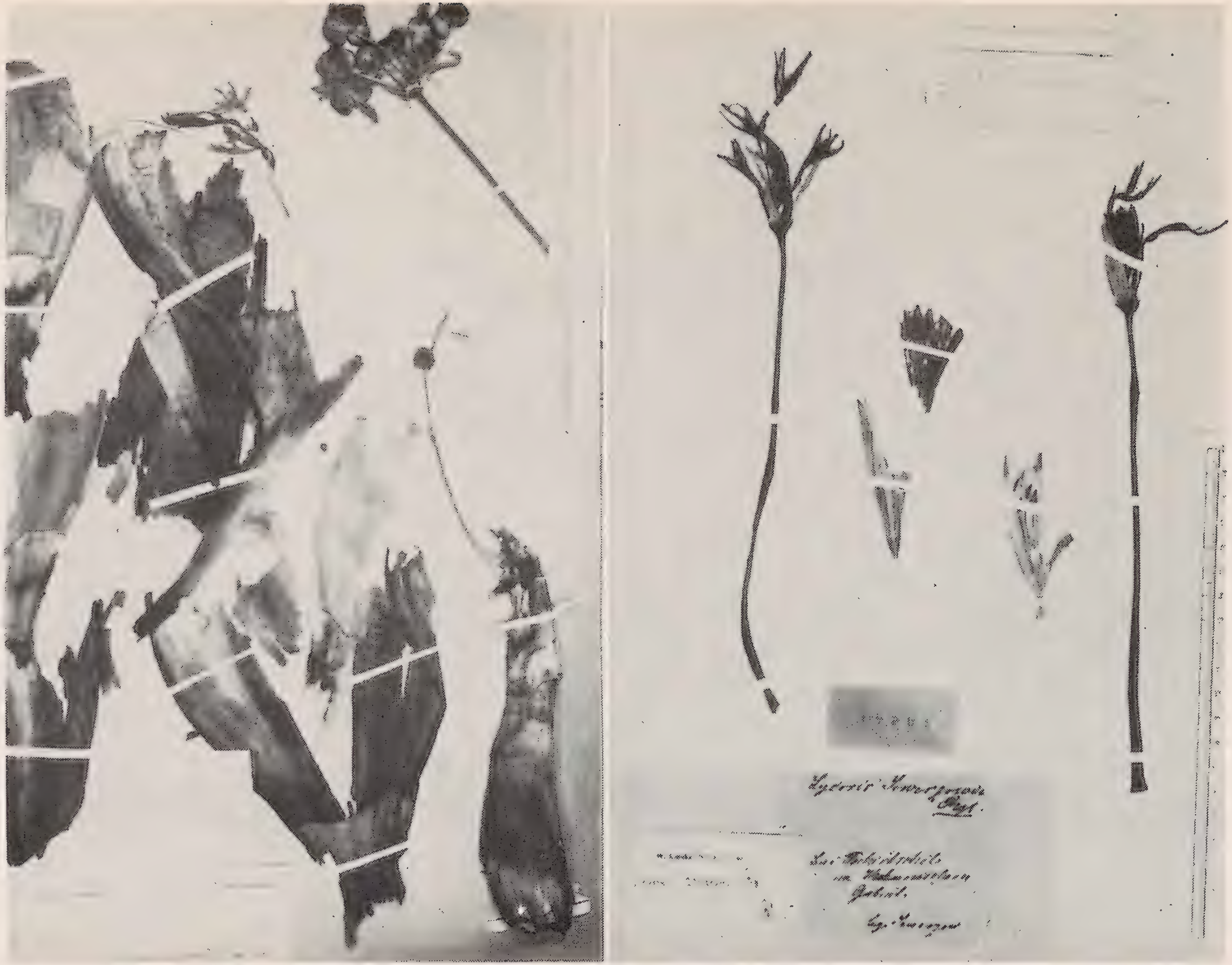

Fig. 33. Left, Holotype of **Ungernia trisphaera** Bge. Right, Holotype of **U. sewerzowii** (Rgl.) Fedsch. B. Both in the Herbarium of the Komarov Botanical Institute, Leningrad.

the color of the perianth (pinkish), *U. spiralis* corresponds to *U. trisphaera,* and differs from it in the twisted leaves. *U. spiralis* is similar to *U. flava* in the small number of flowers in the umbel. Other characters (size and shape of segments, spathe broken into parts, size, color of the scape, and so on) are the same as in *U. trisphaera.*

Until detailed studies of *U. oldhamii, U. flava* and *U. spiralis* can be made on the basis of living material, their status cannot be determined. Therefore, in the present paper, these species are not included.

Vvedensky used the following main features in his treatment of the genus: (1) The size of the bulb. (2) The number and phyllotaxis of the leaves. (3) Form and size of the scape. (4) Number of the flowers in the inflorescens. (5) The size and the color of the perianth.

Taking for a base all the features mentioned above, we compiled a table which gives the opportunity to compare all species and to show how clearly they are distinguished one from another (table 1). A study of the table shows that the species are distinguished only by the color of perianth. *U. sewerzowii* has brick-red flowers without any stripes; *U. trisphaera* and *U. tadshikorum* have pinkish flowers; the differance is that the flowers of the first species have brown stripes on both sides of the segments, the other one has a purple stripe on the inner side of the segments.

The scapes of three species are 5-20 cm high or higher, the bulbs 5-12 cm in diameter. The other three species have shorter scapes (not higher that 20 cm) and the bulbs are 2-7 cm in diameter.

It is possible to distinguish them only on the basis of the color of the perianth: *U. ferganica* light-ochre with purple tips; *U. victoris,* yellowish with a purple stripe on the inner side; and *U. oligostroma,* yellowy-pinkish segments with brown stripes on both sides.

After studing the herbarium specimens it became clear that it is impossible to judge from dry plants about the color of the perianth, neither to distinguish yellowish from yellowy-pinkish or ochre. The same may be said about the more or less dark color of the stripes on the segments since no one can judge by the herbarium specimens what color they are and if they are on both or on one side of the segments.

As to the other features used by Vvedensky, the form and the size of stem, number of leaves and phyllotaxis, number of flowers in inflorescence, they are similar in almost all of the species. It is impossible to distinguish these species on the basis of these features. In this connection we were to find some additional features useful in differentiating species. To do so we studied the epidermis of the leaves and made detailed analyses of a flower, measuring carefully all its parts. We used species of *Ungernia* from the Herbarium of Komarov Botanical Institute of the Academy of Sciences, which were determined by Vvedensky, and also type specimens from the Herbarium of State University of Tashkent.

The results from the study of flowers are shown in table 2. The comparison of the data in the table 2 with the data of the description of the species shows that the size of flower parts vary considerably

TABLE 1. Comparison of some morphological features of the species of the genus **Ungernia.** (after the data by A. J. Vvedensky, 1935)

Species	Size of the bulb	Number of leaves and phyllotaxis	Form and size of the scape	Number of flowers in inflorescence	Sizes of segments	Form and color of the segments
U. trisphaera	7—12	8—15 in tuft	rounded 10—25 cm high	(5)10—20	2—2.5 cm long 0.5—0, 8 cm wide	lanceolate, pinkish with wide brown stripe on both sides.
U. sewerzowii	5—7 cm in diam.	4—7 distichous	rounded (15)20—40 cm high	(5)7—12	2—2.5 cm long 0.4—0, 5 cm wide	narrow-lanceolate, brick-red, monochromatic.
U. oligistroma	2—4	3—5 distichous	5—10 cm high	4—5	2—2.5 cm long 0.5—0, 6 cm wide	narrow-lanceolate yellowy-pinkish with narrow brown stripe on both sides.
U. ferganica	4—5	10 distichous	flattened 10—20 cm high	5—15	2—2.5 cm long 0.3—0, 5 cm wide	linear-lanceolate or narrow-lanceolate, light ochre with purple tips inside.
U. tadshikorum	7—10	8—12 distichous	flattened (15)25—35 cm high	7—17	2.5—3 cm long 0.5—0, 7 cm wide	narrow-lanceolate, yellowy or pinkish with wide purple stripe on the inner side.
U. victoris	4—7	7—10 distichous	flattened 5—10 cm high	(2)4—7	2—2.5 cm long 0.4—0, 6 cm wide	narrow-lanceolate, yellowish with pink-purple stripe on the inner side.

TABLE 2. Comparison of some morphological features of the flower structure of the species of the genus **Ungernia.** (after specimens in the Herbarium of Komarov Botanical Institute)

Species	Where collected	The size of segments	Length of tube	Length of filaments		Length of Staminal Cup	Length of style
				1st circle	2nd circle		
U. **trisphaera**	Mountain Turkmen. Meshed.	2—3 cm long 0.5 cm wide	0.8—1 cm	2	2.5	0.4—0.6	2.5—3
U. **sewerzowii**	Talasskij Alatau	3 cm long 0.6 cm wide	0.9 cm	1.7	2	0.7	3
U. **oligostroma**	Turkestan. ridge, basin of r. Zaamina	3.2 cm long 0.3 cm wide	1 cm	2	2.5	0.6	3.1
U. **ferganica**	Ferganskij ridge	4.3 cm long 0.3 cm wide	1 cm	2	2.5	0.7	4
U. **tadshikorum**	West slopes of Khodga-Mastan and on the east from Aral	3.2 cm long 0.5 cm wide	0.7 cm	2	2.5	0.5	3.0
U. **victoris**	North slopes of Adir, to the north of Zargar	4.2 cm long 0.3 cm wide	1 cm	2	2.5	0.7	4.2
U. **victoris**	Foot of the mountain Baba-Taga	3.5 cm long 0.3 cm wide	1.2 cm	2	2.3	0.7	3

within a species. That is why Vvedensky did not attach importance to these features in distinguishing new species.

Peculiarities of cell structure of the epidermis can be used for this purpose (Fig. 36). So *U. sewerzowii, U. victoris, U. oligostroma* and *U. tadshikorum* have elongated, more or less right-angled cells, *U. trisphaera* has elongated epidermis cells, but they are tapered, and *U. ferganica* has cells of irregular form. The difficulties were that in studing the genus we had three species only which had grown in their natural habitat. Some of the bulbs were transplanted in the ground, others were cultivated in the glasshouses. The plants did not blossom in both cases; they were only in the vegetative stage. That is the reason

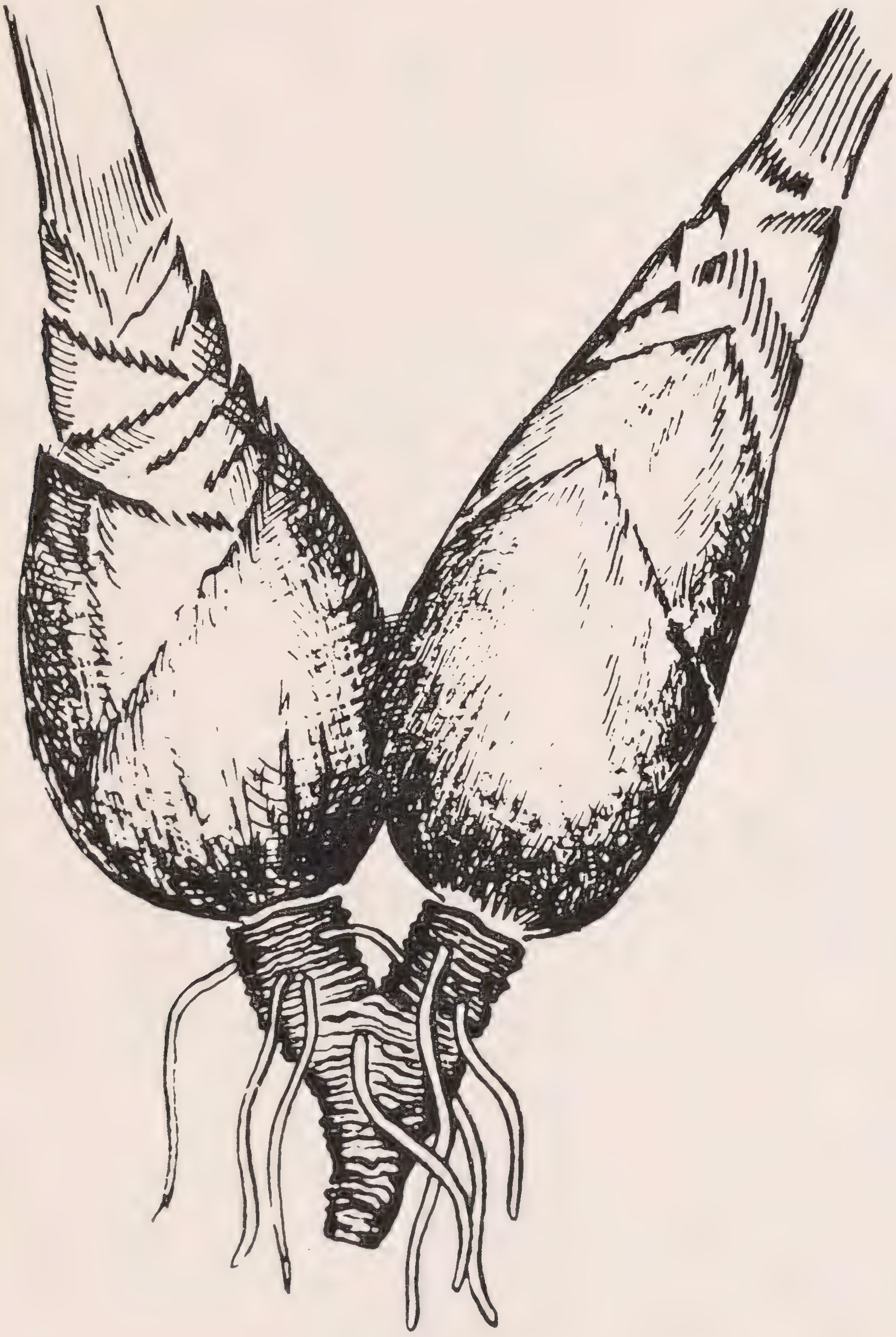

Fig. 34. Two bulbs of *Ungernia trisphaera* on a branching rootstock.

why morphogenesis of *Ungernia* was studied after the specimens were received annually from Middle Asia. The specimens were sent in different stages of their development. In connection with difficulties in receiving living specimens, we also studied herbarium material, especially in the study of reproductive organs.

The basic chromosome number of the genus was determined as X=12 by Baranov and Poddubnaia (1925) for *U. sewerzowii.* Forty years later, after having studied the karyotypes of the two species of *Ungernia,* the scientific workers of the cytosystematic laboratory of Komarov Botanical Institute, O. I. Zakharjeva and L. M. Makushenko (1969), found out that the basic number of the genus had been wrongly determined. They believe that the mistake was due to the wrong methods used by Baranov and Poddubnaia in making the preparations. Zokharjeva and Makushenko (1969) used squashed preparations and discovered that the basic chromosome number of the genus *Ungernia* is 11 (X=11) for *U. sewerzowii* and *U. tadshikorum.* These authors showed also that the karyotypes of these two species are identical.

Morphological and biological features. The species of *Ungernia* are perennial plants, they have large bulbs covered with numerous died off and living scales. Very often in layers of dead scales to about 1.2-2 cm; it is impossible to count the number, because they are paper-like and stick together. In most of the amaryllid bulbs, the lower part of the bottom stem dies off with the dying of the outside scales. It happens in another way with *Ungernia* bulbs: the bottom lives some years without the dead scales as a short vertical branching rootstock (Fig. 34). There are fibrous roots on it which die off on the lower part of the rootstock. They are rather thick, fibrous, feebly branching, in some species up to half a meter long. So the severing of the mother bulb from a filial one happens with the dying off the connecting part of the rootstock, but not with that of the scales in the axil of which they were formed. Both bulbs are quite independent before disconnecting: every one has its own root system, they do not suffer from a mechanical disconnection and grow normally after it.

The sizes of bulbs of different species are from 4-5 cm to 10-12 cm. in diam. There are two types of *Ungernia* bulbs: some have only tunicate scales, others have tunicate and semi-tunicate scales in turn, *U. sewerzowii* and *tadshikorum* have the scales of the first type, *U. trispharera* has the scales of the second type. Unfortunately we did not have enough living bulbs of the other species to study their structure. One or two are basal scales, and 4-6 scales which are a base of assimilating leaves or a sheath, are formed in a bulb during the vegetative period (Fig. 35). As we mentioned above, in the bulb of *U. sewerzowii* the scales are tunicate and formed from the basal leaves or sheath and from the lower part of assimilating leaves. It is difficult to make out which scales are the bases of sheath leaves, and which are the lower part of assimilating leaves. All semi-tunicate scales of the *U. trisphaera* bulb are formed from the lower part of assimilating leaves and it is easy to see them at the dormant bulb. The character of the bulb-scales is a good diagnostic feature for some *Ungernia* species.

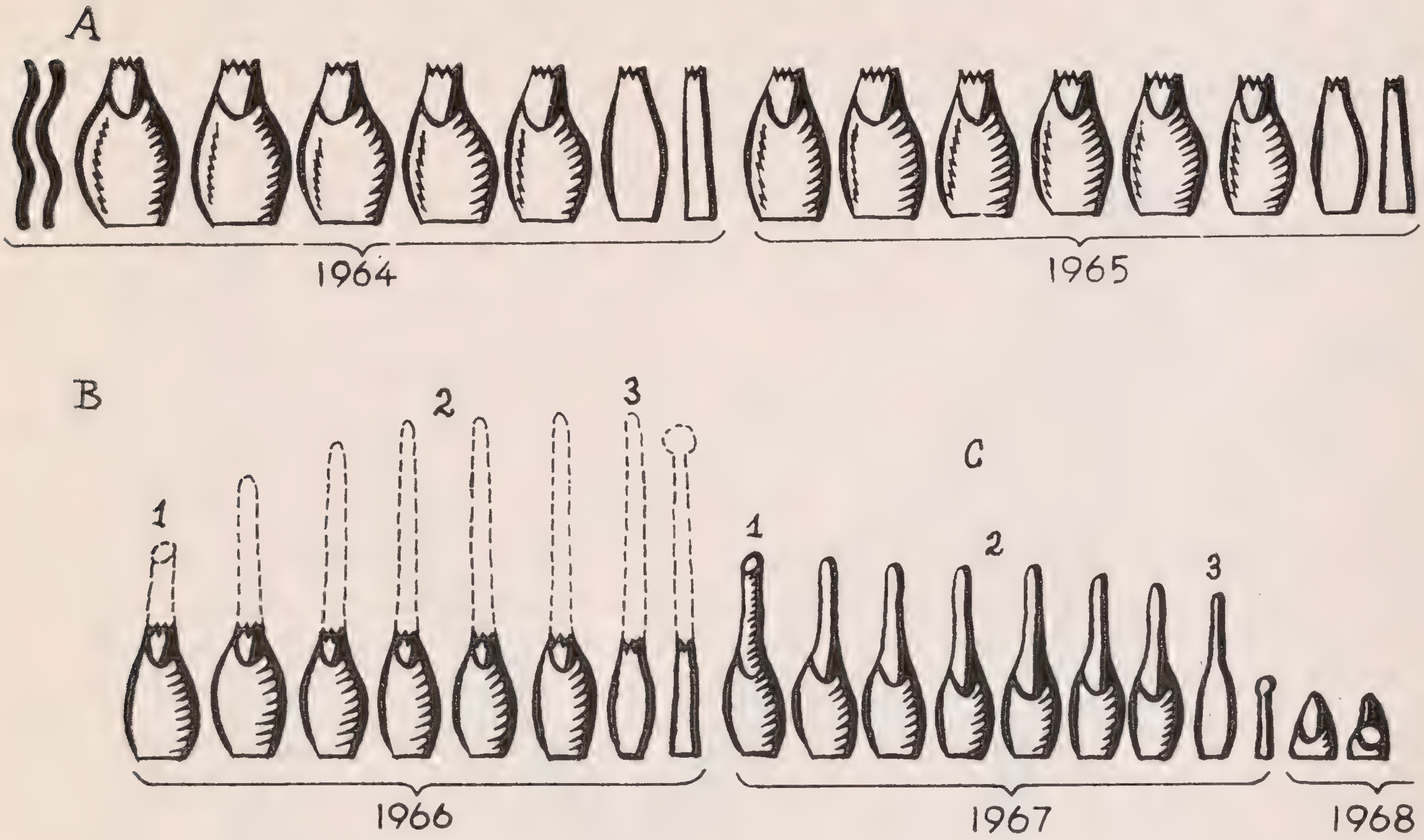

Fig. 35. *Ungernia sewerzowii,* showing structure of the bulb: (A) bulb-scales and scape of the just passed year (1964-1965); (B) bulb-scales and scape of the present year (1966); (C) young scale, leaves and scape (a bud) in (1967); and 1968, the beginning of a new bud.

Ungernia anatomy. External (morphologically lower) side of the bulb-scale is covered with epidermis, adjoining the parenchymic tissue, cells of which are filled with starch. The tissue is pierced through with vascular bundles; there are big colourless parenchyma cells in the scales. There are more such cells in the direction of the inner (morphologically upper) side of plate, where they make up a tissue with a great number of intercellulars and cavities, formed after the gelatinization of cells. Such structure of the bulb-scales is typical for all the amaryllids.

Ungernia epidermal cells are of three types. Cells of *U. sewerzowii, U. tadshikorum, U. victoris* and *U. oligostroma* are elongated, more or less right-angled, *U. tadshikorum* cells are slightly tapered. *U. ferganica* epidermal cells are slightly elongated, of irregular form, almost every cell has a stomate at the end (Fig. 36) *Ungernia* has a strongly developed cuticle, which forms protuberances of different kinds, which makes it difficult to study the epidermal structure.

Leaf anatomy of the species studied is similar. A row of palisade cells under the upper and lower epidermis, then 2-3 rows of spongy cells. Large colorless cells forming cavities adjoin them (Fig. 37).

The shape of the cavities is the same for all *Amaryllidaceae.* At the beginning the colorless cells are filled with raphides, then the

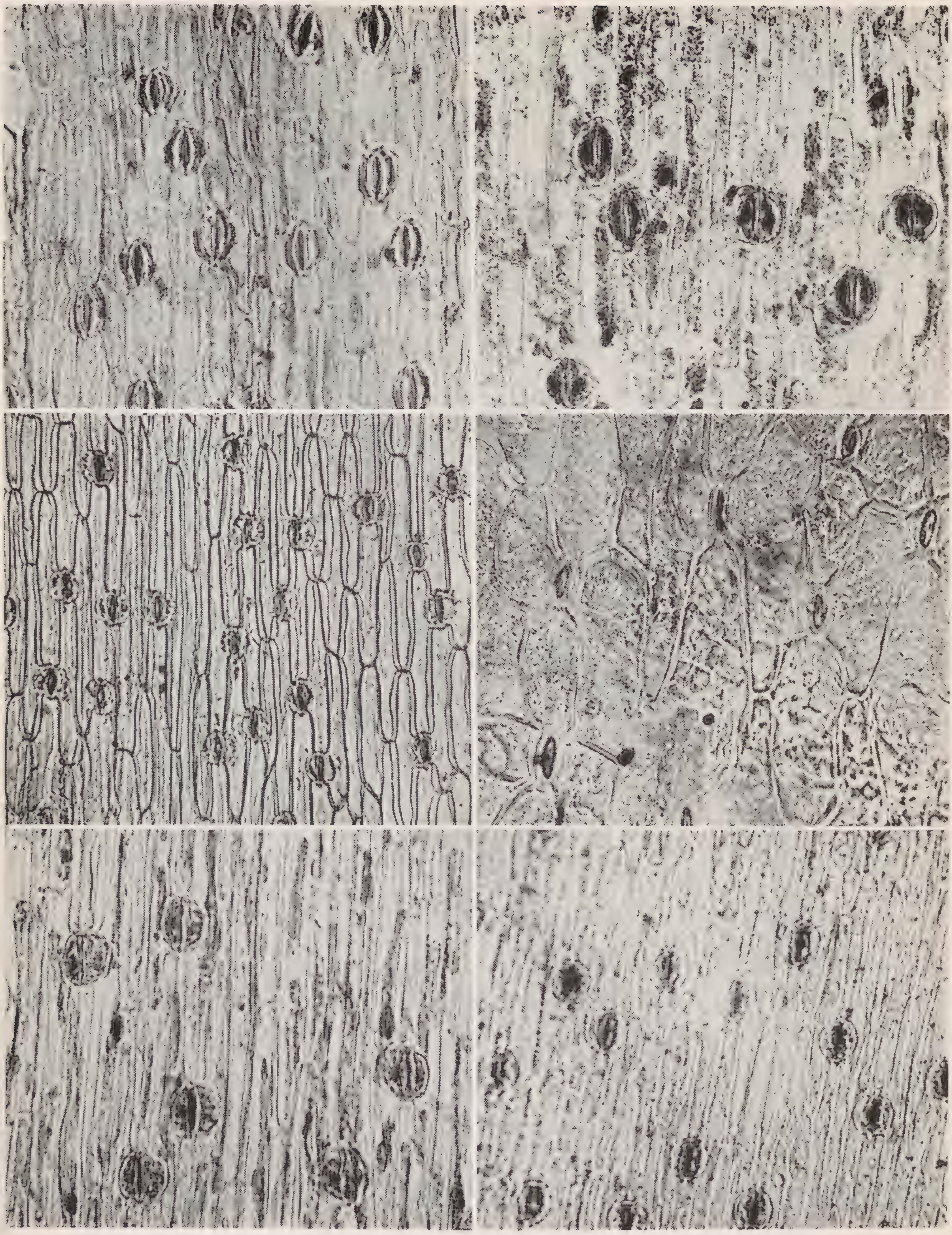

Fig. 36. Epidermis of **Ungernia** leaves showing variation in cell and stomate size and shape for the six recognized species. Originally photographed at X65; reduced to approx. X46 in reproduction.

Upper left **U. trisphaera**; upper right, **U. sewerzowii**; middle left, **U. oligostroma**; middle right, **U. ferganica**; lower left, **U. tadshikorum**; lower right, **U. victoris.**

raphides disappear, cell walls swell and slim and we see a cavity filled with slimy substance instead of raphides. Subsequent development of slimy substances is the same for all *Amaryllidaceae.* After dying off of the above-ground parts of the plants slimy substances move to the bulb scales and stay there as solid conglomerates in the cavities formed after sliming of the scale cells. Very often the conglomerates are so massive that there is no room in the cavity; then a rupture takes place and the cavity is filled with these substances in rather big clots. These substances harden in the air.

30 vascular bundles are set in a row; mechanical tissue adjoins the vascular bundles only.

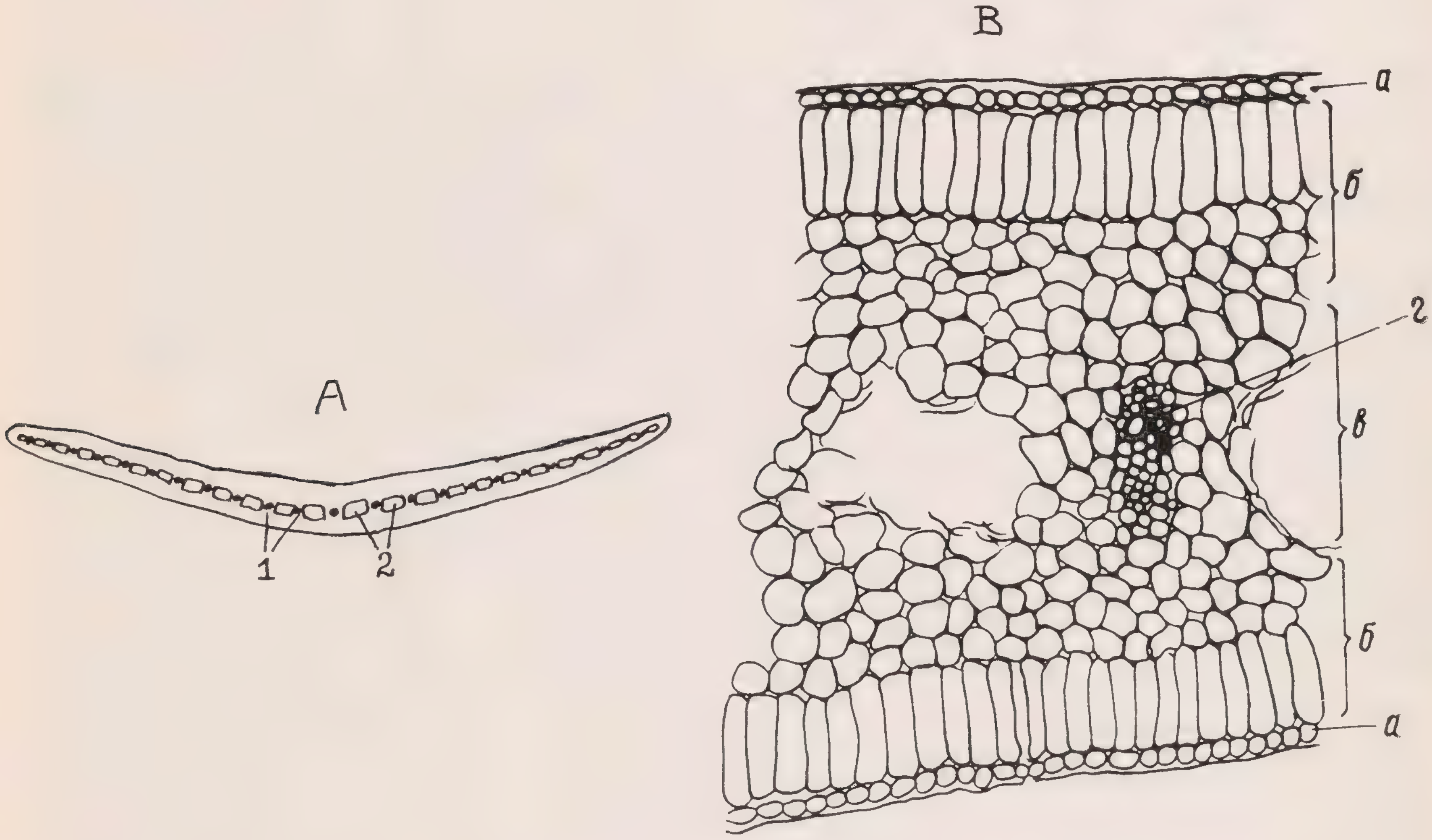

Fig. 37. Anatomical structure of the *Ungernia* leaf: (transverse section of the whole leaf; (B) transverse section of a part of the leaf (enlarged), showing epidermis, palisade cells, spongy cells, cavity and vascular bundle.

The scape of *Ungernia* on a transverse section is semi-rounded or slightly compressed, ribbed. It is covered with epidermis under which are several rows of mesophyll tissue. The central part is filled with colorless parenchyma cells, with vascular bundles among them. There is a group of cells with thickened walls around every bundle. Parenchyma cells slim by the ripening stage of fruit and all the central part fills with slimy substance.

Ungernia development. We could not investigate plant development from seed to an adult individual. *Ungernia* development during a year has features peculiar to all bulbous plants. Leaves appear above the ground in February, with first warm spring days. They vegetate

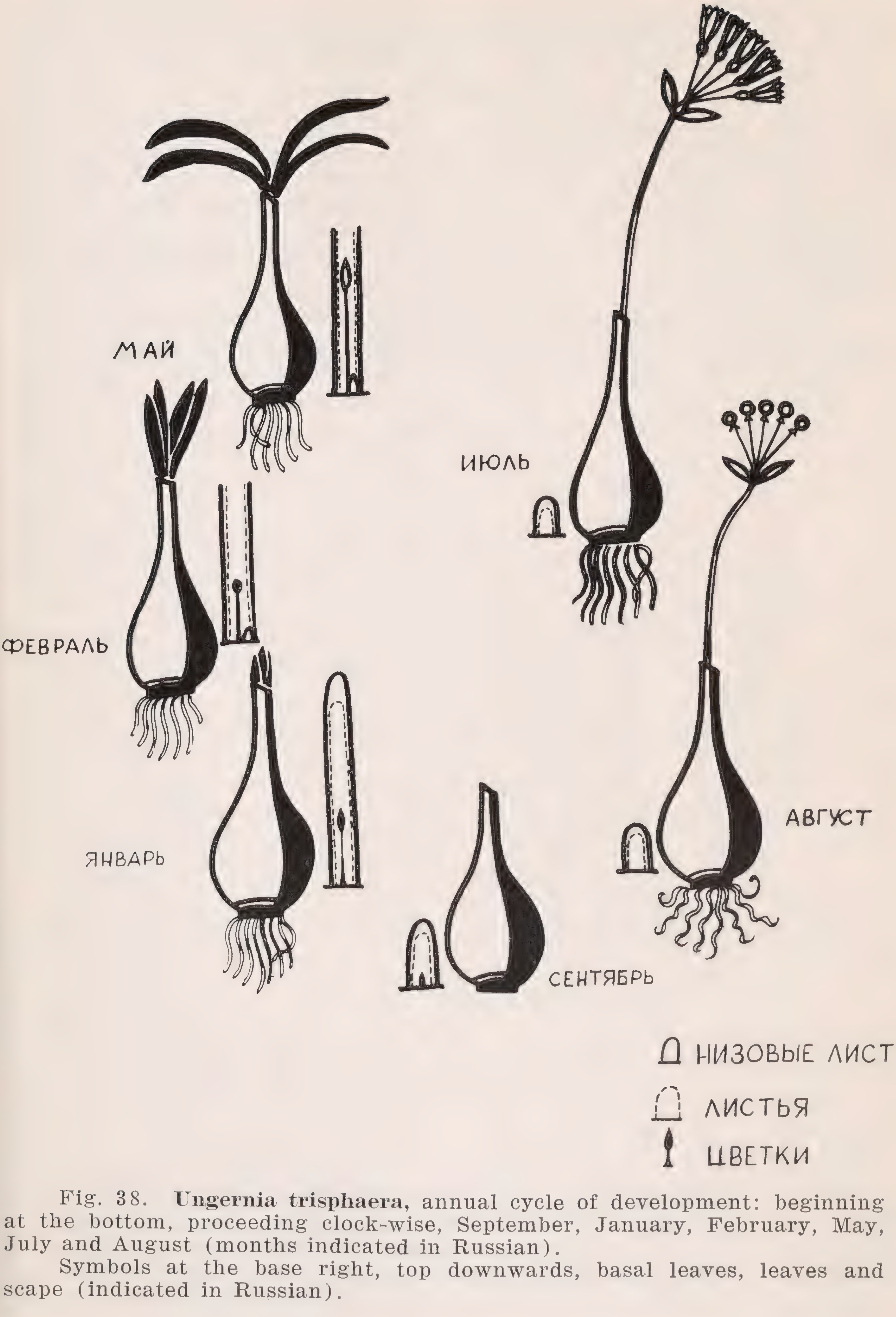

Fig. 38. **Ungernia trisphaera**, annual cycle of development: beginning at the bottom, proceeding clock-wise, September, January, February, May, July and August (months indicated in Russian).

Symbols at the base right, top downwards, basal leaves, leaves and scape (indicated in Russian).

only for 4 months and die off at the end of May. At this time an intensive underground development of the inflorescence takes place and flower primordia begin to grow, which were initiated in the previous year. In July they are fully formed and start to blossom at the end of July to the beginning of August. A renewal bud for next year's primordia appears at the base of the scape. It consists of leaf primordia at the beginning and primordia for flower bearing organs or inflorescence added later. During spring leaf development is greater than the development of reproductive organs; that is why there is some months break between the growth of the leaves and the appearance of the flowers. (Fig. 38).

Geography and taxonomy. As we mentioned above, species area of the genus *Ungernia* is Middle Asia and its borderlands (Afghanistan and Iran). All of them are in the mountains. *U. trisphaera* grows in mountains of Turkmenistan (northern slopes of Kopet-Dag) but possibly the main part of its area is within Iran, because it was described from Meshkhed and mentioned in flora of Afghanistan (Kitamura, 1960). *U. sewerzowii* and *U. ferganica* are found in the Tien Shan mountains; *U. tadshikorum, U. victoris* and *U. oligostroma,* in the Pamir

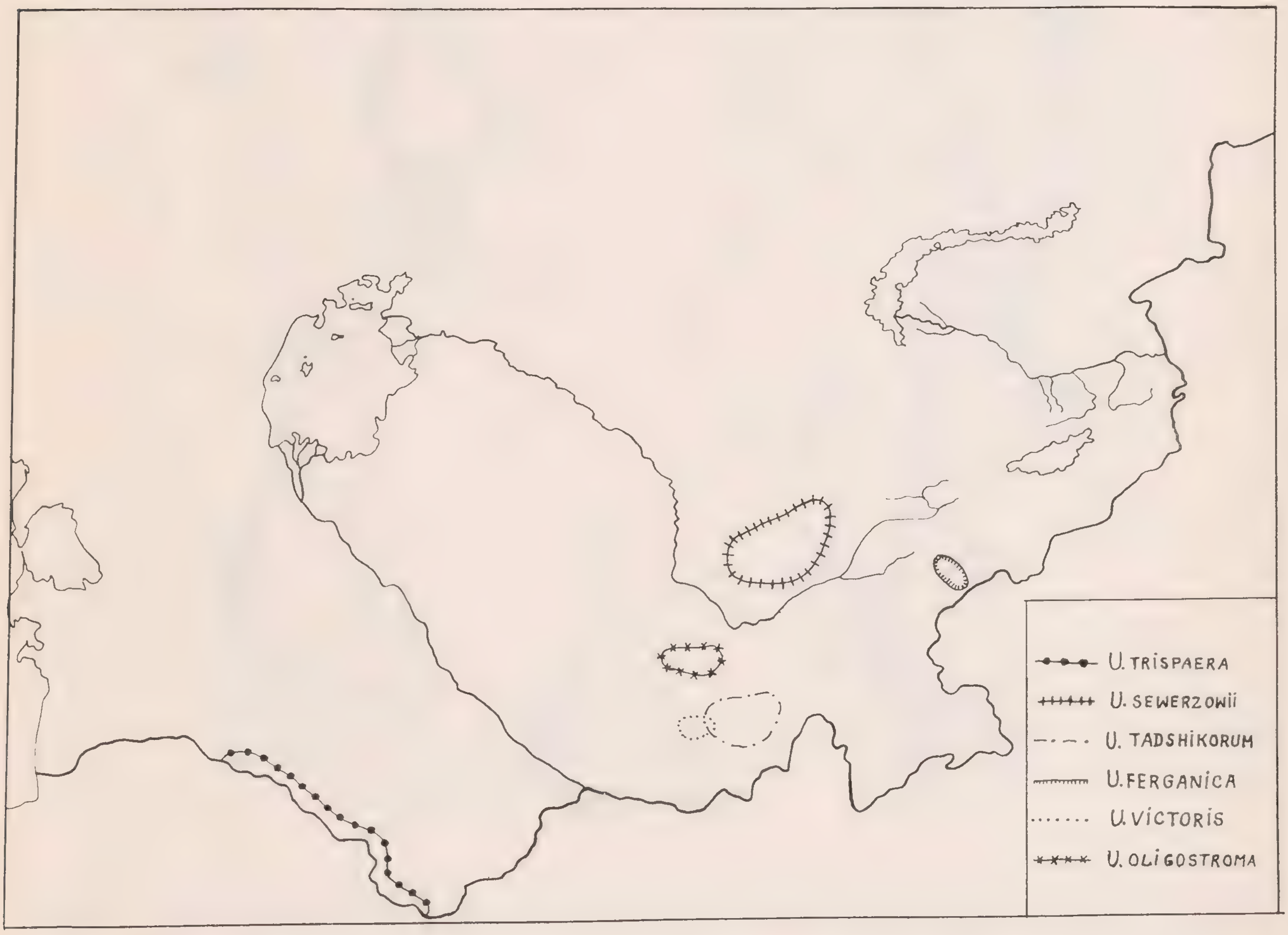

Fig. 39. Map showing the distribution of *Ungernia* species in the U. S. S. R.

—Alaj (Fig. 39). Different species grow at different altitudes and on different soils within the boundaries of indicated mountains.

UNGERNIA BGE.

1875, Bull. Soc. Nat. Mosc. 49, 2:273; Traub & Moldenke, 1949. The Genus *Ungernia*, In Amaryllidaceae: Tribe Amarylleae. pp. 158—164.

Perianth funnel-shaped almost regular, slightly crooked tube. Stamens in two rows, inner stamens longer. Filaments thin, inserted in the tube lower than the throat: anthers oblong, versatile. Ovary deeply three-furrowed with numerous ovules; style filiform, stigma capitate. Capsule angular at the loculars; seeds black, compressed.

Bulb big, with a long neck. Leaves bluish lorate developing before blooming. Scape a few to many-fld umbel, surrounded with bracts, the outer biggest one envelopes the inflorescence. Typus generis: *U. trisphaera* Bge. 6 species in the genus, growing in the mountains of Asia.

Key to the species of the genus *Ungernia* Bge.

1. Scape of 20 cm or higher 2
— Scape up to 20 cm high 4
2. Bulbs of 5-7 cm in diam.; 4-6 leaves, segments without stripes, brick-red .... 2. *U. sewerzowii* (Rgl) B. Fedtsch.
— Bulb of 7-12 cm in diam.; 8-15 leaves; segments with stripe 3
3. Segments pink with wide brown stripes on both sides .... 1. *U. trisphaera* Bge.
— Segments yellowish or pinkish, wide purple stripe on the inner side .... 5. *U. tadshikorum* Vved. ex Artjush.
4. Inflorescence with 5-15 flowers; segments light-ochra with purple tips .... 4. *U. ferganica* Vved. ex Artjush.
— Inflorescence with 4-7 flowers 5
5. Segments yellowy with pinkish-purple stripe on the inner side .... 6. *U. victoris* Vved. ex Artjush.
— Segments yellowy-pinkish with thin brown stripes on both sides .... 3. *U. oligostroma* M. Popov et Vved.

1. *U. trisphaera* Bge. (See Fig. 33.)

1875, Bull. Soc. Nat. Mosc. 49, 2:273; Boiss. 1884, Fl. Or. 5:146; Pax und Hoffm. 1930, Engl.-Prantl. Natürl, Pflanzf., ed 2,15a:406; B. Fedtsch. 1932, Fl. Turkm., 2:317; Vved., 1935, Fl. USSR, 4:482.

Bulb ovate, 7-12 cm in diam.; leaves about 15, linear, grey=blue, 25-40 cm long and 3-5 cm wide. Scape rounded, 10-25 cm high, umbellate inflorescence with 10-20 flowers at the end; 6 segments concrescing in tube 1 cm long. Perianth pinkish, wide brown strips on both sides of segments, which 2.0-3 cm long and 0.5-0.8 cm wide. Stamens in two circles; filaments of outward circle 2.0 cm long, inner circle 2.5 cm long concrescing to the tube of perianth for a distance of 0.5 cm from its base. Style about 3 cm high with a clavate stigma. Capsula about

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2 cm in diameter. Blossoms in July. 2n=22 (Zakharieva and Makushenko, 1969).

On fixed sands and on outcrops of bedrocks.

Distribution in the USSR: Mountain Turkmenistan (Sari-Jazi; Kushka, Pul-e-khatum, Serakhs, Kaakhka, Jablonovskoje).

Described from Meshkhed. The type is in Leningrad (Fig. 33).

2. *U. sewerzowii* (Rgl.) B. Fedtsch. (See Fig. 33.)

1915, Veg. Turkestan: 256; Vvedensky, 1935, Fl. USSR, 4:485; Vvedensky, 1941, Fl. Uzbek., 1:498; Nikitina, 1951, Fl. Kirgiz. SSR, 3:120; Pavlov, 1958, Fl. Kazakhst., 2:231; *Lycoris sewerzowii* Rgl. 1868, Soc. Nat. Mosc. 41, 1:435.

Bulb oblongo=ovate, 5-7 cm in diam.; leaves 4-6, linear, grey=blue about 20 cm long and 1.5-2 cm wide. Scape rounded (15) 20-40 cm high with an umbellate inflorescence of (5) 7-12 flowers. Segments brick-red, without strips 2.5-3.0 cm long and 0.4-0.6 cm wide. Perianth tube 0.9 cm long. Stamens in two circles: filaments of outward circle 1.7 cm long, of inner one 2 cm long, concrescing to the perianth tube for a distance of 0.7 cm from its base. Style 3 cm high with a clavate stigma; capsule 2-2.5 cm in diam. Blossoms in July-August. 2n=22 (Zakharjeva and Makushenko, 1969).

On the slopes of stone and rock debris at the steppe zone of mountains.

Distribution in the USSR: Tian Shan: south-west spurs of Tallasky-Alatau, Chatkalsky range.

Described from Chirchik. The type in Leningrad.

3. *U. oligostroma* M. Pop. et Vved.

1937, Veget. Preserve of Guralash and Zaamin forest tracts, 2nd edition: 6; *U. minor* Vved., 1935, Fl. USSR, 4:484; Vvedensky, 1941, Fl. Uzbekist. 1:498; Vvedensky, 1936, Fl. Tajik. SSR, 2:364.

Bulb ovate, 2-4 cm in diam. Leaves 3-5, linear, grey-blue. Scape 5-10 cm high with an umbellate inflorescence of 4-5 flowers. Segments yellow=pink with thin brown stripe on both sides, 2-3.2 cm long and 0.3-0.6 cm wide; perianth tube 1 cm long. Stamens in two circles: filaments of the outward circle 2 cm long, of the inner one 2.5 cm long, concrescing to the perianth tube for a distance of 0.6 cm from its base. Style 3 cm high. Capsule 2-2.5 cm in diam. Blossoms in July-August. 2n=22 (Zakharjeva and Makushenko, 1969).

Rocky slopes, at a height above sea level of 1700-2300 m.

Distribution in the USSR: the Pamirs-Alaj (Turkestansky range) Kogan-Tau, northern slope of ravine Bjuragan-Sai.

Described from Zaamina. The type in Tashkent.

4. *U. ferganica* Vved. ex Artjushenko

1970, Amaryllid. of the USSR; Vvedensky, 1935, Fl. USSR, 4:484, descr. ross,; Nikitina, 1951, Fl. Kirgiz. SSR, 3:120.

Blub oblongo=ovate, 4-7 cm in diameter. Leaves about 10, linear, grey=blue. Scape flattened out, 10-20 cm high with a inflorescence of 5-15 flowers at the end. Segments light ochra with purple tips on the inner side, 2-4.3 cm long and 0.3-0.5 cm wide, perianth tube 1 cm long. Stamens in two circles: filaments of the outward circle 2 cm long, of the inner one 2.5 cm long, concrescing to the perianth tube for a distance of 0.7 cm from its base. Style up 4 cm high. Capsule 3-3.5 cm in diam. Blossoms in July-August. 2n=22 (Zakharjeva and Makushenko, 1969).

On the rocky slopes of the steppe zone of mountains.

Distribution in the USSR: Tian-Shan; Fergansky range.

Described from Kugart. The type in Tashkent.

5. *U. tadshikorum* Vved. ex Artjushenko

1970. Amaryllidaceae of the USSR; Vvedensky, 1935, Fl. USSR, 4:483, descr. ross.; Grigoriev, 1935, Opredel. vegetab. suburbs of Stalinabad: 90; Vvedensky, 1963, Fl. Tadgikist. 2:362.

Bulb oblong, ovate, 7-10 cm in diam.; leaves 8-15, linear, bluish, 25-30 cm long and 2.5-4 cm wide. Scape flattened out. (15) 25-30 cm high, with an umbellate inflorescence of 7-17 flowers. Segments of perianth yellowy or pinkish, wide purple strip on the inner side, 2.5-3.2 cm long and 0.5-0.7 cm wide, perianth tube 0.7 cm long. Stamens in two circles: filaments of the outward circle 2 cm long, of the inner one 2.5 cm long concresting to the perianth tube for a distance of 0.5 cm from its base. Style 3 cm high with a club-shaped stigma. Capsule 2-2.5 cm in diam. Blossoms in July-August. 2n=22 (Zakharjeva and Makushenko, 1969).

On the clayey slopes of the steppe zone of mountains.

Distribution in the USSR: Pamiro=Alai; Sanglok, Huli=zandan, Tevil=Daga; Hodga=Mastak.

Described from the m. Sanglok. The type in Tashkent.

6. *U. victoris* Vved. ex Artjushenko

1970, Amaryllidaceae of the USSR; Vvedensky 1935, Fl. USSR 4:483 descr. ross.; Vvedensky, 1941, Fl. Uzbek. 1:496; Vvedensky, 1963, Fl. Tadgik. SSR., 2:364.

Bulb ovate, 4-7 cm in diam. Leaves 4-7, linear, grey-blue 20-25 cm long and 2.3 cm wide. Scape flattened out, 10-20 cm high with an umbellate inflorescence of (2) 4-7 flowers. Segments yellowy with pinkish-purple strip on the inner side, 2-4.2 cm long and 0.3-0.6 cm wide; perianth tube 1-1.2 cm long. Stamens in two circles: filaments of the outward circle 2 cm long, of the inner one 2.5 cm long, concresting to the perianth tube for a distance of 1-1.2 cm from its base. Style 3-4 cm high. Blossoms in August.

On the rocky slopes at a height of 2000-2500 m.

Distribution in the USSR: Pamiro-Alay (m. Tsulbair, the valley of the r. Hanaka-su, southern slopes of the range Dapbase-Kon).

Described from Sika. The type in Tashkent.

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Zakharieva O. I. i Makushenko L. M. 1969. Chromozomnie tchisla odnodolnich rastenyi iz semeistw Liliaceae, Amaryllidaceae, Iridaceae: Araceae. Bot. Journ. 54. 8.

Kaempferia cv. 'Pobeda' (Korsakoff, 1969)

Flower white, with yellow blotch at the base of lip, the yellow of the blotch margined on both sides with faint lavender bars.

Always interested in hybridizing everything at hand, I was rewarded with a new white color variety. On Aug. 15, 1965, with the wife's nimble fingers, **Kaempferia decora** and **K. kirkii** var. **elatior** were crossed reciprocally. Seed was obtained both ways. A few seedlings of both crosses survived up to the present. On July 6, 1968, the first seedling flowered, sending up an upright spike as **K. decora** does, with eight florets of the same size as decora's, but white in color. **K. decora** has bright yellow flowers and **K. kirkii** var. **elatior** has lavender flowers with yellow center. All seedlings are indistinguishable from the parents in growth habit, except that the flowers are white.—**Alek Korsakoff**

PLANT LIFE LIBRARY

HALDANE AND MODERN BIOLOGY, edited by K. R. Dronamraju. The Johns Hopkins Press, Baltimore. 1968. 333 pp. $10.95. As a memorial and contribution to an understanding of the late J. B. S. Haldane, this book has a list of distinguished contributors, but on the whole is disappointing. Truly one of the intellectual giants of the first six decades of the twentieth century, Haldane deserves a better fate. Several of the papers could just as well have been published in conventional journals since they contribute little to an understanding of Haldane, or his contributions to biological thought. Even further afield is an article in the Appendix by Mourant, which is essentially an unabashed plug for the International Biological Programme (IPB).

In the realm of biological thought Haldane was truly a "Man for All Seasons." There was little on the frontiers of biology that did not arouse his interest and most of these interests resulted in publications of substantial merit. In this connection it should be remembered that at the apogee of his career, Haldane had plenty of competition. It was not easy to find your way into the biological limelight in company with such brilliant scientists as Morgan, Sturtevant, Muller, Fisher, Wright, Darlington, Beadle, and several others.

As a student and disciple of Sir Frederick Gowland Hopkins, Haldane was one of the first to insist that gene action must be interpreted in terms of biochemical reactions. Caspari in a chapter on Haldane's contribution to biochemical genetics, states that, "Haldane's most important contribution to the development of biochemical genetics, however, was his early appreciation of the need to describe the nature of the gene, and gene action in biochemical terms."

Although Haldane's ideas on the nature and origins of life are adequately discussed by Pirie, and to a lesser extent by Oparin, it comes as a surprise to note the omission of Haldane's contributions to evolutionary thought. His book, "'The Causes of Evolution," published in 1932 is a classic in this field, and contributed much to the outstanding research that followed in developing our understanding of the processes of organic evolution. Such productive scholars as Dobzhansky, Stebbins, Mayr, or Simpson are among those well qualified to assess Haldane's work in this area. Their names, however, do not appear among the list of contributors.

A considerable segment of Haldane's life is almost completely ignored or overlooked. Here I refer to his Marxian political philosophy that seemed so attractive to him shortly after the conclusion of World War II. How he was able to rationalize Marxism with the false dogmas of Lysenkoism would have been of much consequence to an understanding of Haldane. The Editor apparently could not persuade anyone to tackle this job, or perhaps he preferred to let sleeping dogs lie.

Naomi Mitchison, Haldane's sister, has provided an interesting sequence of reminiscences that covers the period from Haldane's boyhood up through World War I. It is one of a series of short essays in the Appendices and has the title "Beginnings." It makes pleasant reading, and suggests some of the events that may have shaped the mature individual.

It is distressing to record that the book has no complete Bibliography of Haldane's scientific publications, although Professor Sewell Wright has listed about 80 of Haldane's papers, mostly concerned with some aspect of genetics. The usefulness of the book will be handicapped by lack of a good index. In spite of its several faults, this book will be an important resource for anyone interested in Haldane, a brilliant, clever, many sided, stimulating, and absorbingly interesting human being.—**Thomas W. Whitaker**

TROPICAL CROPS. DICOTYLEDONS 1 [Vol. 1] and DICOTYLEDONS 2 [VOL. 2], by J. W. Purseglove. John Wiley and Sons, Inc., New York. 1968. 719 pp. Illus. $8.50 per volume. Modern texts on tropical agriculture are scarce, or nearly nonexistent; hence an authoritative book on tropical crops has a ready made niche to fill. Prof. J. W. Purseglove, Professor of Botany and Plant Pathology, University of the West Indies, Trinidad, is as well equipped by training and experience as any living person to author a text on tropical crops. For thirty years he has traveled, worked and taught in the tropics of Africa, the Far East and the New World. Moreover, these two volumes on Tropical Dicotyledons, comprising a total of 719 pages, are based primarily upon actual studies of the extensive living collections maintained by the University of the West Indies at St. Augustine, Trinidad. Incidentally, the line drawings for which there are a set for nearly every crop, are excellent. It is evident they were based upon fresh material.

The book is arranged by plant families listed in alphabetical order, as are the genera within each family. These two volumes are loaded with useful information. Under each species there are such subheadings as: uses, origin and distribution, ecology, structure, pollination, chemical composition, propagation, husbandry, major pests and diseases, improvements, production, and a few references. As an added bonus the chromosome number of each species is given where known.

A useful and handy innovation is the Appendix at the end of Volume 2. The Appendix gives the scientific name, family, common name, use, origin and the page reference for each crop. There is also an Index of 28 pages which includes the common names of the plants referred to in the text, and the common and scientific names of the major diseases and pests. There is a list of about 72 General References. The Appendix, Index and list of General References occupy the terminal 54 pages of Volume 2. This arrangement appears to be a device originated by the publisher to trap the prospective customer into purchasing both Volume 1 and Volume 2. They are, however, worth the price ($8.50 each) for anyone with even a mild interest in tropical agriculture. For agronomists, botanists, and those who need a good reference work on tropical crops, these two Volumes will be indispensable. We shall await with great interest Prof. Purseglove's treatment of the Tropical Monocotyledons used as crop plants.—**Thomas W. Whitaker**

PLANTS: ADAPTATION THROUGH EVOLUTION, by Joan Eiger Gottleib. Reinhold Book Corp., New York. 1968. pp. 114. $2.25. The author of this book, Dr. Joan Eiger Gottleib, is a firm believer in the proposition that a working knowledge of plant biology is a minimum requirement for any serious science student. Furthermore, she insists that an account of the plant kingdom is an essential part of any good biology text. This little paperback volume of 114 pages was designed to cope specifically with these problems. The book is one in a series of Reinhold's, "Selected Topics in Modern Biology," on the general subject of the diversity of life, edited by Peter Gray.

Dr. Gottleib has simplified her task by shunting all plants below the mosses into the "Protista." Besides its convenience there are some good biological arguments for this controversial division. It will, however, be difficult to convince some mycologists and algologists they have spent their careers working with organisms other than plants.

In the preface, Dr. Gottleib promises to bring maximum readability to the story of the plant kingdom. Surely an unbiased critic would agree that she has fulfilled her pledge. Even the conventional life cycle diagrams come alive under her treatment. She is particularly skillful at articulating the descriptive material of plant science into meaningful patterns. Several of her analogies are apt and clever, for example: Bryophyta—"Amphibia of the Plant Kingdom" and Pteridophyta—"Botanical Snakes."

PLANT LIFE LIBRARY—continued on page 4.

THE AMERICAN PLANT LIFE SOCIETY

For the roster of the general officers of the Society, the reader is referred to the inside front cover of this volume.

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[A Committee of the American Plant Life Society]

[AMERICAN AMARYLLIS SOCIETY, continued from page 2.]

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1. **AMARYLLIDACEAE: TRIBE AMARYLLEAE**, by Traub & Moldenke (including the genera Amaryllis, Lycoris, Worsleya, Lepidopharynx, Placea, Griffinia, and Ungernia; Manila covers; 194 pages, incl. 18 illustrations. $5.00 postpaid.

This is required reading for every amaryllid enthusiast.

2. **DESCRIPTIVE CATALOG OF HEMEROCALLIS CLONES, 1893—1948**, by Norton, Stuntz, and Ballard. A total of 2695 Hemerocallis clones are included and also an interesting foreword, and explanatory section about naming daylilies. Manila

covers; 100 pages (1—X; 1—90), includes a portrait of George Yeld. $5.00 postpaid.

3. **THE GENERA OF AMARYLLIDACEAE,** by Hamilton P. Traub. Includes a general introduction, a key to the subfamilies, infrafamilies, tribes, subtribes and genera of the Amaryllidaceae, and descriptions of all the genera. Every member of the Society should have this book for constant reference. Manila covers; publ. 1963; 85 pages. $5.00 postpaid.

4. **LINEAGICS,** by Hamilton P. Traub. This is the first outline text for the undergraduate student on the grouping of organisms into lineages. The text is divided into four parts: (a) the history of lineagics and lineagics as an integrated science; (b) basic lineagics, principles and procedures; (c) applied lineagics, principles and procedures; and (d) research methods in lineagics. Recommended for the student in biology. Publ. 1964. Manila covers, 163 pages, incl. 8 illus. $5.00 postpaid.

PERIODICALS

(A) HERBERTIA, or AMARYLLIS YEAR BOOK [**First series,** 1934 to 1948, incl.], devoted exclusively to the amaryllids (Amaryllidaceae), and the workers concerned in their advancement. A complete set of these volumes is indispensable to all who are interested in the amaryllids. Libraries should note that this may be the last opportunity for complete sets.

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ZEPHYRANTHES CLONE

Registered by Alek Korsakoff, Jacksonville, Florida.

'Nicetria' (Korsakoff, 1969) Bulb oval, about 3 cm. long, 2 cm. in diam., neck 1.5 cm. long; tunics dark brown. Leaves 52-57 cm. long, 1.1 cm. wide; spinach green. Scape 14 cm. long. Spathe 3 cm. long, united below to 1.3 cm. Pedicel 1.5 cm. long. Ovary 5 mm. long, 3 mm. in diam. Perigone colored Amaranth Rose (530/2 HCC), 6 cm. across; tepaltube 1.5 cm. long, green; tepalsegs with margins undulated, 5 cm. long; setsegs 2.5 cm. wide, petsegs 1.8 cm. wide, both rounded at the apex.

The cross, **Zephyranthes** [(**Z. atamasco** ♀ x **Z.** sp. K484 ♂) ♀ x **Z. grandiflora** ♂] was made Mar. 27, 1966; first seedlings bloomed Apr. 12, 1968. Holonomenifer; Korsakoff G76B, 4-3-69; No. 1002 (TRA), grown by Alek Korsakoff, Jacksonville, Fla.

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STREET TREES IN EGYPT, by M. Nabil El Hadidi and Loutfy Boulos. Herbarium, Botany Dept., Faculty of Science, Cairo University, Giza, U. A. R. 1968. Foreword, Introduction by Vivi Taeckholm. 4 figures, 52 plates and Index. This book on the cultivated trees of Egypt fills a definite need. Each plate illustrating a tree is accompanied by the Latin and common names of the subject, and a detailed description in English. This book will help the tourist, native layman, and also the Egyptian student of botany and agriculture, to identify the cultivated trees of Egypt. Highly recommended.

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